UNIVERSITY OF ECONOMICS IN PRAGUE

FACULTY OF INFORMATICS AND STATISTIC

DIPLOMA THESIS

2016   Mgr. Barbora Debnárová

UNIVERSITY OF ECONOMICS IN PRAGUE

FACULTY OF INFORMATICS AND STATISTIC

Department of Information Technologies

Study programme: Applied Informatics

Study Field: Information systems and Technologies

Analysis of the selected national eHealth strategies and a proposal of the conception for the Czech Republic

Student: **Mgr. Barbora Debnárová**

Supervisor: **prof. Ing. Jiří Voříšek, CSc.**

Oponent: **Univ.-Prof. Dipl.-Ing. DDr. Gerald Quirchmayr**

Declaration:

I declare that I worked on this thesis on my own and that I used only sources mentioned in the Bibliography section.

Prague, 26th April 2016

………………

Mgr. Barbora Debnárová

Abstrakt

Táto diplomová práca sa zaoberá analýzou eHealth stratégií nemecky - hovoriacich krajín a návrhom koncepcie pre Českú republiku. Prvá časť je venovaná teórii. Na začiatku poskytuje stručný prehľad literatúry, ktorá už bolo napísaná na túto tému. Ďalej sa zaoberá témou elektronického zdravotníctva všeobecne, jeho históriou, aplikáciami, výhodami a nevýhodami a spôsobom, ako je eHealth riešené na úrovni Európskej únie.

Druhá kapitola poskytuje analýzu eHealth stratégií v Rakúsku, Nemecku a Švajčiarsku. Na konci tejto kapitoly sa nachádza porovnanie aktuálnych stavov elektronického zdravotníctva v týchto krajinách.

Tretia kapitola sa zaoberá súčasným stavom eHealth v Českej republike.

Posledná kapitola je venovaná návrhu koncepcie pre Českú republiku.

Abstract

This diploma thesis is dedicated to the analysis of eHealth strategies of the German speaking countries and to the proposal of a conception for the Czech Republic.

The first part is dedicated to theory. At the beginning, it provides a brief review of the literature which has already been written about this topic. Further, it deals with the topic and definition of eHealth in general, its history, applications, benefits, and the way how eHealth is approached by the European Union.

The second chapter provides analysis of eHealth and its technologies in Austria, Germany and Switzerland. At the end of the chapter, the comparison of the current states of eHealth in these countries is conducted.

The third chapter deals with the current state of eHealth in the Czech Republic.

The last chapter is dedicated to the proposal of the conception for the Czech Republic.

Kľúčové slová

eHealth, národné stratégie, riadenie eHealth, Rakúsko, Nemecko, Švajčiarsko, Česká republika

Keywords

eHealth, national strategy, eHealth management, Austria, Germany, Switzerland, Czech Republic

Content

Introduction

Motivation of the diploma thesis

This diploma thesis is dedicated to the topic of eHealth and to the question of how eHealth is approached in the German speaking countries and in the Czech Republic.

The World Health Organization (WHO) defines eHealth as *"the use of information and communication technologies (ICT) for health"* [WHO, 2015]. In spite of the fact that information and communication technologies that apply to health and healthcare systems are able to improve the quality of life and increase the efficiency of healthcare, their potential has still not been fully utilized. For the last years, the European Union and its member states have been trying to improve this potential. The Czech Republic belongs among these countries, too. However, despite of great effort, various conducted projects didn´t reach any success. There still isn´t any official eHealth strategy and many aspects remain undone.

As approaches to the electronization of healthcare in the EU states vary from each other, it can be supposed that the Czech Republic could inspire from best practises gained by other states, to enhance its eHealth development.

The German speaking countries were selected for the purpose of this thesis. The focus on these states is based on their geographical and cultural proximity to the Czech Republic and to each other, and on the fact that all of them provide rather different attitudes to the electronization of healthcare.

The analysis is focused mainly on Austria due to two main reasons. Firstly, a part of the research that was conducted in Austria enabled to the author an access to the broader spectrum of information resources. Secondly, Austria can be regarded as the country which reached the greatest success in eHealth development among the selected states. This success can be defined for example by the rather successful introduction of the system of electronic health records or for instance by the early introduction of the electronic health cards.

Aims of the thesis

The main aim of this master thesis is to analyse national eHealth strategies of the German speaking countries and create a draft concept for the eHealth strategy for the Czech Republic based on this analysis.

Partial aims of the thesis:

- Analysis of the national eHealth strategies of the German speaking countries and their comparison
- Contribution to the creation of the national eHealth strategy in the Czech Republic, providing relevant information obtained from the strategies of the German speaking countries
- Critical evaluation of the current state of the eHealth strategy of the Czech Republic and creation of a draft concept for the eHealth strategy for the Czech Republic

Methodology

At the beginning of the thesis, an analysis of eHealth and its technologies in Austria, Germany and Switzerland is provided. The information used in the analysis come mainly from the literature which has already been written on this topic.
Afterwards, the states in the countries are compared.
Further, the state of eHealth in the Czech Republic is analysed and consequently a proposal of the conception for the Czech Republic is provided. The proposal of the conception is based on the information gained from the analysis of the strategies of the German speaking countries and the state in the Czech Republic, plus some additional information from literature are provided.

The structure of the analysis is inspired by the *"Final European Progress Report"* called *"European countries on their journey towards national eHealth infrastructures"*

introduced in 2011[1]. The report is dedicated to the analysis of the state of eHealth (policy development, planning, implementation measures, evaluation activities) in the EU and EEA Member states focusing on objectives set in the *"European eHealth Action Plan"* of 2004.

The report is based on *"a thorough analysis of eHealth strategies and implementation activities in European countries"*[Stroetmann, 2011, p. 4] and the results reached at a validation workshop in 2010 in Brussels attended by *„representatives of Member States and other European countries, national health authorities and competence centres, stakeholder associations, vendors, and European health policy and eHealth experts"* [Stroetmann, 2011, p. 4].

All the chapters of the thesis, including the comparison and the proposal for the Czech Republic, follow this structure.

1. Governance - institutional structures, stakeholder involvement, legal, reimbursement and evaluation issues:
    - Administrative responsibility and competence centres
    - Involving stakeholders
    - Legal and regulatory facilitators
    - Financing and reimbursement issues
    - Evaluation activities

2. Deployment of eHealth applications:
    - Patient summaries and electronic health records
    - ePrescription
    - Telehealth

3. Infrastructure implementation aspects:
    - Electronic identifiers and eCards
    - Standards.

---

[1] STROETMANN, K. A., ARTMANN, J., STROETMANN, V. N. European countries on their journey towards national eHealth infrastructures. *esacproject.net.* [Online] 2011. http://es.esacproject.net/sites/intranet.esacproject.net/files/ehstrategies_final_report.pdf.

Constraints of the thesis

There are three main constraints in the thesis:

1) As well as all the analysed strategic documents represent "*citizen centered - and not technology - driven concepts for the continuous development of public health through the use of ICT*" [Eine Informations- und Kommunikationsstrategie für ein modernes österreichisches Gesundheitswesen, 2007, p. 6], the aim of this master thesis isn´t a proposal of a technological solution for eHealth, nor a presentation of a final eHealth implementation plan in the country. The purpose of this thesis is to bring a complex view on the state of eHealth in the analysed states and to define areas of eHealth which should be processed in the Czech Republic as a priority.

2) Because of the fact that the diploma thesis is dealing with a very current topic, there have not been many monographs and academic articles written on it. There are mainly resources from the Internet, including especially primary documents issued by governments of the states, European Commission and organizations dealing with eHealth used in the thesis.

3) As the thesis strictly follows the structure set by the *"Final European Progress Report",* it can happen that some of the important projects executed in the analysed countries won´t be mentioned.

Outline

The thesis is divided into the following sections:

The first part is dedicated to theory. At the beginning, it provides a brief review of the literature which has already been written about this topic. Further, it deals with the topic and definition of eHealth in general, its history, applications, benefits, and the way how eHealth is approached by the European Union.

The second chapter provides analysis of eHealth and its technologies in Austria, Germany and Switzerland. At the end of the chapter the comparison of the current states of eHealth in these countries is conducted.

The third chapter deals with the current state of eHealth in the Czech Republic.

The fourth and last chapter is dedicated to the proposal to induce the conception of this model for the Czech Republic.

Outcomes and expected contributions

The main contribution brought by this thesis is a draft concept for the eHealth strategy for the Czech Republic. Moreover, the analysis of the current state of eHealth in the selected states following the structure from - *"The Final European progress report"* - can represent an update of the analysises which were conducted in the countries in 2010 to create this report. Creation of such updates can be interesting mainly because of the fact that there are many changes that have occurred in these states since 2010.

1. Theoretical part

1.1. Literature

This part of the thesis provides a brief review of the academic works which has already been written on the topic of eHealth and its management.

1.1.1. European and overseas resources

- **Managing eHealth: from vision to reality - M. ROSENMOELLER** [Rosenmoeller, 2014]

The authors of the book *"Managing eHealth: from vision to reality"* Magdalene Rosenmoeller, Diane Whitehouse and Petra Wilson dedicate to the management of eHealth. They have tracked eHealth technological transformations from the 1990s onward, and stress the importance of eHealth management and the challenges that need to be overcome to achieve full eHealth potential. They divide their work into three sections: *"Politics: Policy and Institutions"*; *"People: Professionals, Patients and Consumers"*; and *"Practice: New Ways of Working and Other Challenges"*. For the purpose of this diploma thesis, the part of the book dealing with eHealth in the relation to the European Union is regarded as especially valuable. This part is also dedicated to eHealth policies at national level.

- **European countries on their journey towards national eHealth infrastructures – K. A. STROETMANN** [Stroetmann, 2011]

Karl A. Stroetmann, Jörg Artmann and Veli N. Stroetmann in their report *„European countries on their journey towards national eHealth infrastructures"* map and compare the state of eHealth development (policy development, planning, implementation measures, evaluation activities) in the states of the European Union in 2010, focusing on objectives set in the European eHealth Action Plan of 2004. This report and its structure serves as a foundation guidance for this thesis.

- **What Is eHealth: Perspectives on the Evolution of eHealth Research – D. ADHERN** [Adhern, 2006]

David Adhern, Jennifer Kreslake, Judith Phalen and Beth Bock for the purpose of the article called *„What Is eHealth (6): Perspectives on the Evolution of eHealth Research"* published in the *Journal of Medical Internet Research* conducted series of interviews amongst opinion leaders (stakeholders) in eHealth in order to assess strengths and challenges in eHealth evaluation research. Based on these interviews, they recommend to establish accreditation mechanisms to standardize, approve, and monitor the development of quality eHealth applications, incorporate emerging technologies into environments occupied by traditionally underserved groups, foster technological interoperability to promote eHealth connectivity, and implement evidence-based eHealth solutions to transform and enhance healthcare provision.

- **Praxisbuch eHealth: von der Idee zur Umsetzung - R. Trill** [Trill, 2008]

The Roland Trill´s book *"Praxisbuch eHealth: von der Idee zur Umsetzung"* is dedicated to the topic of eHealth in Germany. In this book several authors from research, education and practice in their contributions, illuminate different aspects of the subject area and provide practitioners and executives based information on all relative areas of application, the technical implementation and the data protection implications of this new technology, and aid to decision-making; several examples of applications of telemedicine (radiology, cardiology), also from other European countries, illustrate the diverse possibilities of a network established form of medical care.

- **Verfügbare eHealth - Applikationen in Österreich : Evaluierung in Bezug auf funktionelle Benutzeranforderungen – A.Ströher** [Ströher, 2010]

In his work *Verfügbare eHealth-Applikationen in Österreich : Evaluierung in Bezug auf funktionelle Benutzeranforderungen"* Alexander Ströher describes and evaluates the process of implementation of electronic health records (ELGA) in Austria. He deals with several of the following questions: How much do the specifications by the ARGE ELGA really focus on the field of technology? Which user´s needs have already been defined? What are the key user requirements? In order to respond to these questions,

a survey in the form of a standardized questionnaire was provided. The analysis and the results of this survey are represented as the content of the book.

1.1.2. Czech a Slovak resources

• **eHealth a telemedicína – L. STŘEDA** [Středa, 2013]

The series of articles called *"eHealth a telemedicína"* published in *"Zdravotnické noviny" MF* by Leoš Středa and Petr Panýrek, provide information on eHealth theory, evolution and the Czech eHealth strategy, which are significant for this master thesis. The series of articles *"eHealth a telemedicína"* seeks to raise awareness of eHealth and telemedicine amongst physicians and the wider public. At the beginning of *"eHealth and telemedicína"*, the authors focus on the theoretical definition of eHealth and telemedicine, its market potential and benefits. Further, attention is paid to the specific use of telemedicine. The authors share their experience with the monitoring of obese people using monitor devices such as smart sensors and scales of physical activity. Data is obtained from these devices that physicians and patients can use to improve the current condition and lifestyle choices.

• **Fragmenty z elektronizácie zdravotníctva v teórii a praxi- E. KUKUROVÁ** [Kukurová, 2013]

The book *"Fragmenty z elektronizácie zdravotníctva v teórii a praxi"* by Elena Kukurová and Peter Labaš includes many texts on various topics related to eHealth and telemedicine. Amongst those belong works about eHealth ethics, evolution, different eHealth services and financing of hospitals. For this diploma thesis, especially the works concentrating on eHealth needs and trainings and education of physicians are considered for very important.

1.2. eHealth

1.2.1. Definition and history

In his article *"What Is eHealth: Perspectives on the Evolution of eHealth Research"*, David Adhern defines eHealth as the use of interactive technologies to improve health and healthcare services. Such technologies are for example the Internet, personal digital assistants, interactive television and voice response systems [Adhern, 2006]. According to Jeremy C. Wyatt and Joseph L.Y. Liu, eHealth is the use of internet technology to get access to information, services and support connected to health and lifestyle [Wyatt, 2002]. Silver writes that eHealth stands for the application of information and communication technologies across various functions affecting health [Silver, 2003]. Leoš Středa and Petr Panýrek, in their paper *"eHealth a telemedicína"*, define eHealth as electronic and informatized health using information and communication technologies to support diagnostic, therapy, prevention, monitoring and managing of health as a part of one´s lifestyle [Středa, 2011, p. 1]. According to Tony Sahama, eHealth means the use of ICT in order to deliver heath care services, specifically the *„communication, sharing, retention and disposal of health information"*[Sahama, 2013, p. 2]. To conclude the section of definitions, here is the definition from the World Health Organization (WHO): *"eHealth is the use of information and communication technologies (ICT) for health. Examples include treating patients, conducting research, educating the health workforce, tracking diseases and monitoring public health"*[WHO, 2015].

The evolution of the discipline that we nowadays know as eHealth started at the end of the nineteenth century with Alexander Graham Bell´s invention of the telephone. This made it possible for anyone to call a doctor or a hospital. Later, it was possible to transmit EKG via telephone lines. In the 1950s, teleradiology, telepsychiatry[2] and teleconsultations[3] were developed [Kukurová, 2013, p. 87 - 93]. In the seventies and eighties, teleconsultations among the greatest health professionals stood for the leading eHealth activity. In the last decades, digitalization, computerization and creation of digital networks allowed to extend the spectrum of eHealth applications [Středa,

---

[2] Telepsychiatry is defined as phone conversation between patient and psychiatrist .
[3] Teleconsultations mean a phone conversation between patient and internist.

2011, p. 3]. Among those belong for example computer tomography, nuclear magnetic resonance, positron emission tomography, sonography, and others [Kukurová, 2013, p. 87 - 93]. In 2001, the first telesurgical operation was realized (transatlantic laparoscopic operation of cholecystectomy between USA (New York) and France (Strasbourg)) [Kukurová, 2013, p. 87 - 93].

The scientific discipline called eHealth (possible to write also as e − health) was before known under different names. In the 1970s, eHealth was called *"medical informatics"*. Then, it was renamed to *"medical telematics"* [Středa, 2011, p. 3]. The term eHealth was firstly used at the 7th International Congress on Telemedicine and Telecare in London in November 1999. In 2005, WHO accepted eHealth to be an effective way to achieve effective and secure use of information and telecommunication technologies in health [Středa, 2011, p. 3].

1.2.2. Actors and environment

eHealth concentrates on interactions on several levels. Firstly, it focuses on the dialog between patient and doctor. Secondly, it deals with the interaction between medical facility and related facilities. Thirdly, it specializes in interaction among patients themselves and among health specialists [Středa, 2011, p. 1]. It is possible to state that eHealth represents the so called *"connected healthcare"*. All the actors encompassed by eHealth, namely healthcare providers, academic medical centres, government, payers, patients and pharmaceutical manufacturers are pictured in the following figure.
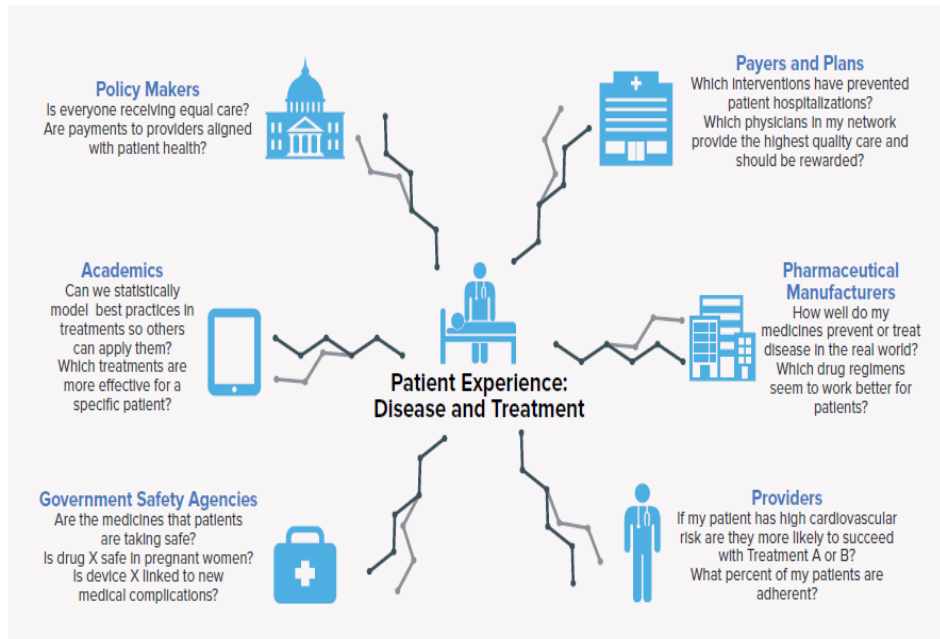
Fig 1: Vision of connected healthcare [IMS Institute for Healthcare Informatics, 2015]

1.2.3. Applications for eHealth administration

For the purpose of the analysis, it is necessary to introduce basic applications which eHealth offers and with whose introduction most of the countries have been struggling for several years.

The following applications were selected because the *"Final European Progress Report"* from 2011, which should serve as a guidance for this analysis, focuses on these applications of eHealth, too. Moreover, the following applications belong among most important applications which most of the European countries have sought to implement in the last years.

Electronic health records (EHR)

One of the basic eHealth applications which recently have been introduced in almost all of the EU countries are electronic health records.

Patient´s electronic health records (EHR) are defined as *"a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting"* [Menachemi, 2011]. Among such data belong for example *"patient*

demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports" [Menachemi, 2011].

Electronic cards (eCards)

eCards are electronic versions of insurance cards which realisation varies in the EU countries in various aspects: the type of card (simple plastic cards, cards with a magnetic strip to carry basic data, various types of smart chips imbedded in the card), the data stored on the card (basic administrative data, more detailed data on the insurance status, rarely any clinical data), the sophistication of the security features, the use (only purpose of healthcare or multipurpose like for example eGovernment card) [Stroetmann, 2011, p. 45].

ePrescription

The term ePrescription stands for both, the direct computer – to - computer transmission of the prescriptions from a doctor to a pharmacy [Odukoya, 2003] and bringing of the prescription from the doctor to the pharmacy by the patient stored on a secure data medium. The main advantages of this tool are significant fastening of the process, reliable issuing of medicine to patients and cost saving [Lehmann, 2005, p. 649 - 713].

Telemedicine

Telemedicine is defined as *"the delivery of healthcare services through the use of Information and Communication Technologies (ICT) in a situation where the actors are not at the same location"*[Schmid, 2010, p. 27]. In other words, it means an interaction between patient and doctor on spatial distance in relation to diagnosis and treatment [Strategie "eHealth" Schweiz, 2007, p. 57]. Among such services belong for example teleconsultations, teleconference, telediagnostic, telemonitoring, telesurgery, teleradiology [Dugas, 2003, p. 109 - 110].

1.3. Benefits and risks of eHealth

1.3.1. Benefits of eHealth implementation

There are many benefits offered by eHealth services. Based on the analysis of the literature on the topic of eHealth, some of them will be introduced in this part of the chapter.

Overall health improving

Electronic healthcare brings about many positive effects which contribute to general health improvement.

First of all, it fosters more exact decision-making of health professionals, which helps to facilitate earlier diagnosis [Internet Innovation Alliance, 2011] and to decrease the number of patients harmed by a medical mistake [Catwell, 2009].

Secondly, it empowers patients, giving them an opportunity to take responsibility for their own health [Bozikov, 2015, p. 2-5], which also increases awareness of patients and contributes to facilitating earlier diagnosis and prevention [Internet Innovation Alliance, 2011].

Further, eHealth helps to save lives using remote consultations [Internet Innovation Alliance, 2011].

Furthermore, eHealth contributes to improving care for various groups of patients. Here we speak for example about improving senior care through home – monitoring [Internet Innovation Alliance, 2011].

Providing possibilities to reach patients at relatively low cost and quickly

eHealth provides the possibility to reach patients with worse access to healthcare – living in remote locations, housebound, or members of traditionally underserved population - at relatively low cost and quickly [Adhern, 2006].

Enhancing administrative coordination

Electronic healthcare contributes to enabling of coordination of processes and stakeholders in healthcare, and hinders some processes from errors. This can result in healthcare costs reduction [Bozikov, 2015, p. 2-5]. For example, it was estimated that providing services like Medication Approval Service, Social Security Query Service, Preventive Medical Checkup Documentation and Electronic Temporary Disability Report, eCard in Austria enables to save administrative costs in Austria annually to approximately 50 million euro [Bugnar, 2010].[4]

Ecological benefits

Regarding the fact that healthcare systems belong to the major emitters of carbon gases, electronisation of healthcare can have an important environmental effect through the reduction of carbon emissions [Catwell, 2009].

1.3.2. Risks of eHealth implementation

Despite of the fact that there are many benefits that eHealth can bring to its users, its implementation faces various problems. Based on the analysis of the literature on the topic of eHealth, some of them will be introduced in this part of the chapter.

Data security and privacy

Together with the increase in use of information technologies in healthcare, concerns about privacy and data security have increased. Information privacy is *"a term which refers to the ability of an individual to exercise control over their personal data held by others"* [Sahama, 2013]. Data security is defined by *"The Collins English Dictionary"* as *"the protection of data stored on computers"* [Collins Dictionary, 2016] from three possible threats: loss, wrong modification, theft of confidential data [Collins Dictionary, 2016].

---

[4] It is possible to find more information about these functionalities in the following chapter.

It is possible to claim that data security and information privacy are a more important topic for eHealth technology than for many other types of technologies. That is to say that eHealth technology differs from other types of digital technologies in several aspects. First of all, it deals with private individuals' health information, which is usually sensitive and often shared only among the patient, his doctors, relatives and friends. Second of all, medical monitoring often provokes the feeling that the patient is permanently monitored. Third of all, the fact that medical technology is connected to such intimate topic as diseases makes it distinctive enough from other information and communication technologies that we use in our everyday lives [Wilkowska, 2012, p. 192-200].

The basic problem of data security and information privacy regarding eHealth is the fact that for the purpose of effective healthcare, huge amounts of information about an individual are stored at one place. Misuse or incorrect use of the information can therefore cause severe damage [The Schwedisch Parliament, 2011].

Technological illiteracy

It is a fact the major consumers of healthcare services are people who belong to an older generation. This group of people is also generally less technologically literate and tends to be unwilling to work with technological gadgets. Furthermore, not only patients, but also medical professionals often lack technological literacy and optimism about the use of new technologies [Adhern, 2006].

Legal questions

A legal framework which is fragmented and still not necessarily adequate also represents a risk connected to electronic healthcare. Such a legal framework isn't offering enough reimbursement schemes for eHealth services. Legal questions are an especially important issue in the matter of mobile applications and the data collected by such applications [Národní plán rozvoje eHealth, 2010].

Limited options to introduce uniform solutions

Diversity is one of the most important challenges eHealth must face. Technological structure in regions is different. User groups of eHealth services are also very diverse. Therefore, it is very complicated to implement uniform eHealth solutions [Strategie "eHealth" Schweiz, 2007].

Costs

Several problems are connected to money in eHealth. For example, setting up eHealth systems requires high initial costs, states often lack own budgets for eHealth, and/ or cost – effectiveness is only hardly measurable by eHealth solutions [Adhern, 2006].

Self – therapy

The great amount of high-quality online information can lure people into treating themselves instead of visiting a doctor. On the one hand, the patient can sometimes be healed this way and it saves time and costs of both, the patient and the doctor. On the other hand, for some health problems it is necessary to see a doctor [Strategie "eHealth" Schweiz, 2007, p. 18].

1.4. *eHealth in the EU*

In this part of the first chapter, the way how eHealth is approached on the European Union level will be described, regarding the fact that computerisation in almost all areas of administration is nowadays very popular phenomenon within the Union.

There are a number of areas that can be considered for the EU priorities – agriculture, ecology, food safety. Unfortunately, health has never really belonged among them [Bozikov, 2015, p. 2-5]. However, computerisation hasn´t avoided neither this area and we can observe an increasing use of electronic healthcare to deliver top - quality care to citizens of the European Union [Bozikov, 2015, p. 2-5].

This part of the chapter is divided in three essential parts: institutions, documents released by the EU including the topic of eHealth and realised projects.

1.4.1. Institutions

Regarding institutions, eHealth is in the European Commission covered by three directorates: Directorate General for Communications Networks, Content and Technology; Directorate General for Health and Food Safety [ezdravotnictvo, 2011] and Directorate General for Health and Consumer Protection. These directorates cooperate significantly on research and development of eHealth solutions [Rosenmoeller, 2014].

In order to decide about issues connected to electronic healthcare, the European Commission also often consults with public stakeholders. Such consultations are available on the website of the *„Digital Agenda for Europe"*[5] [Bozikov, 2015, p. 2-5].

1.4.2. Selected documents

In the European Union, one of the most important documents interrelated to the topic of eHealth is *„Europe 2020 strategy for smart, sustainable and inclusive growth"* adopted in 2010 **[Bozikov, 2015, p. 2-5].** The priority of the strategy is to achieve sustainable

---

[5] https://ec.europa.eu/digital-single-market/consultations

development of economy which is based on knowledge and innovation, and where high – employment and social cohesion are present [Europe 2020 strategy for smart, sustainable and inclusive growth, 2010].

The *„Europe 2020 strategy for smart, sustainable and inclusive growth"* was followed by the introduction of the *"eEurope Action Plan"* (a new one after the previous adopted in 2004 [Bozikov, 2015, p. 2-5]). eHealth belongs among the priorities defined in this plan which was created as a part of the *"Lisbon strategy for information society"* in 2000 [Cigánek, 2011].

The *"eEurope Action Plan"* focuses on three principal problems. Firstly, it deals with solutions of common problems and creating a general framework for eHealth support. Here we speak mainly about interoperability of the systems that provide medical information and records, patients´ identification and mobility of patients and medical personnel. Secondly, it solves the problem of fastening of implementation of eHealth tools. Thirdly, it focuses on enhancing of cooperation in areas such as benchmarking and international cooperation [Cigánek, 2011].

The *"Digital Single Market Strategy"* was adopted in 2015 after the European Commission had included creation of *"a connected digital single market"* [Bozikov, 2015, p. 2-5] among its main priorities in its *"Agenda for Jobs, Growth, Fairness and Democratic Change"* believing that the digital single market could provide new job opportunities and create a knowledge – based society in all the sectors of economy including eHealth [Bozikov, 2015, p. 2-5].

eHealth is also included in the document *"The EU digital agenda"* which represents the EU *"digital"* strategy for years 2010 – 2020. According to this document, until the end of 2020, following goals in eHealth should be achieved:
First of all, the EU aims to create recommendations which define minimal common content of patient medical records electronically accessed among the EU member states. Second of all, there should be an enabled electronic access of the EU citizens to their medical records. Third of all, the EU standards for interoperability should be created. Last but not the least, the EU will improve testing and certification of medical information systems and wide spread of eHealth services [Středa, 2011, p. 3].

1.4.3. EU framework programmes

The European Union has supported and co-financed a vast number of eHealth projects and research activities under several programmes since 1988. The projects have covered priority topics like electronic healthcare records, regional and national health networks, telemedicine in homecare and care-at-the-point-of-need to support continuity of care concepts, systems to support people to stay healthy, and systems and tools to support health professionals to work more efficiently and safely on patients [Olsson, 2004, p. 310].

At the beginning of the EU efforts stood the field called *"Advanced Informatics in Medicine (AIM)"* represented by the programmes *"Exploratory AIM"* running from 1988 to 1990 (2nd EU R&D Framework Programme) and *"AIM"* 1991 – 1994 (2nd EU R&D Framework Programme) which helped to create a Europe - wide collaborative environment for all eHealth related stakeholders [Olsson, 2004, p. 311].

The next initiative was brought by the *„EC Fourth Framework R&D (research and development) Programme (FP4)"* running from 1994 to 1998. Regarding eHealth, this programme was intended to meet needs of users using expansion of Internet technology and was able to strengthen position of the health telematics in the European Union, accomplish further development in EHR applications to enhance collaboration of health professionals and provide citizens with health information, and bring integrated telemedicine solutions. During this phase, 130 eHealth regarding projects were conducted.

Next programme named the *"Fifth Framework Programme (FP5)"* was running from 1998 to 2002 and intended to enhance user – friendly information society. In this project, eHealth was represented like *"Applications Relating to Health"*. 35 states took part in it and 135 projects were conducted with 175 million Euro in the EU contribution [Olsson, 2004, p. 311].

The ongoing framework programme is called *"Horizon 2020"* and is aimed for years 2014 – 2020. Its objective is to personalise healthcare making best use of big data to develop better diagnostics, therapies, health promotion and disease prevention strategies [Horizon 2020 - first calls, 2013].

2. eHealth in German speaking countries: Austria, Germany, Switzerland

This chapter will be dedicated to the analysis of the current state of eHealth in the German speaking countries: Austria, Germany and Switzerland. The analysis of each of the states will follow the same structure inspired by the *"Final European Progress Report"* introduced in 2011[67]:

1. **Governance - institutional structures, stakeholder involvement, legal, reimbursement and evaluation issues:**
- Administrative responsibility and competence centres
- Involving stakeholders
- Legal and regulatory facilitators
- Financing and reimbursement issues
- Evaluation activities

2. **Deployment of eHealth applications:**
- Patient summaries and electronic health records
- ePrescription
- Telehealth

3. **Infrastructure implementation aspects:**
- Electronic identifiers
- eCards
- Standards (technical/semantic).

At the end of this part of the chapter, comparison of the state in the analysed countries will be provided and evaluated. To give a better notion of the environment, in which

---

[6] STROETMANN, K. A., ARTMANN, J., STROETMANN, V. N. European countries on their journey towards national eHealth infrastructures. *esacproject.net.* [Online] 2011. http://es.esacproject.net/sites/intranet.esacproject.net/files/ehstrategies_final_report.pdf.

[7] It is possible to read in the introduction, why this structure was selected

eHealth works, healthcare systems of all the analysed states are described at the beginning of the sections dedicated to each of the states.

2.1. eHealth in Austria

2.1.1. Healthcare system in Austria

Healthcare system in Austria can be characterized by several features: high number of easily accessible healthcare facilities, cooperation of many actors, principle of solidarity, affordability, universality [Bundesministerium für Gesundheit, 2013, p. 11].

The main stakeholders in the Austrian healthcare system are the Austrian Parliament, the *"Federal Ministry of Health (BMG)"*, the *"Federal Ministry of Labour, Social Affairs and Consumer Protection (BMASK)"*, social security institutions and advocacy groups. Other relevant stakeholders are represented by providers of healthcare services, healthcare institutions, other ministries, public authorities, patient representatives, charities, planning - and research institutions and a large number of private actors [Bundesministerium für Gesundheit, 2013, p. 6].

In accordance with the Austrian constitution, in all the areas of healthcare system except of the hospital system, the Federal Government holds the primer regulatory responsibility. In the hospital sector, the Federal Government only enacts basic laws, the rest is in the hands of the governments of federal states [Liberman, 2012].

Regarding the accessibility of healthcare, Austria possesses an extensive network of medical facilities. In 2012, there were 277 hospitals (123 public and/or charitable institutions) with 23,562 doctors and 86,445 other healthcare professionals, 13,657 general practitioners, 20,834 persons practicing as specialists and additional 4,797 persons with dentist practise. Regarding pharmaceutical care, there were 2,252 medicinal product dispensaries [Bundesministerium für Gesundheit, 2014, p. 4].

Financing of the Austrian healthcare system primarily comes from income - based social insurance contributions, taxes and private payments formed by direct and indirect co -payments. Insurance system of Austria includes 22 social security institutions with the *"Main Association of Austrian Social Security (HVB)"* as the umbrella organization. Social insurance is compulsory, what means that it is regulated by legislation, which basis is set by the *"General Social Insurance Act (ASVG)"*. The social insurance is

consisted of health, pension and accident insurance and bind to employment. Exceptions are students and pensioners – insurance protection extends on them, too. It is not possible for a person to choose an insurance institution alone as there is no competition among these institutions. To balance differences among social groups, the so called principle of solidarity, which entitles some groups of citizens to some advantages, is applied. Except of the social insurance, Austria citizens have also the possibility to buy a supplementary of complete private insurance [Bundesministerium für Gesundheit, 2013, p. 7].

Regarding planning instruments, the *"Austrian Health Care Structure Plan (ÖSG)"* and the *"Regional Health Care Structure Plans (RSG)"* are key documents in healthcare. At the federal level the *"Federal Health Agency"* and the *"Regional Health Funds"* at the regional level are responsible for promoting of *„joint trans-sectoral planning, steering and uniform funding in the health care sector"*[Bundesministerium für Gesundheit, 2013, p. 8].

On behalf of organisation and funding of healthcare, the *"Health Care Reform"* introduced in 2012 represents very important step for healthcare in Austria. The reform aims at improvement of coordination among various sectors of the healthcare system and development of organisation and control mechanisms at the federal and provincial level, following the principle of effectiveness. Regarding financing tools, the *"Health Care Reform"* calls for *„a gradual alignment of public health care spending with the medium-term forecast for nominal GDP growth (currently 3.6%) by 2016"* [National Reform Programme Austria, 2013].

2.1.2. eHealth definition in Austria

The Austrian eHealth strategy defines eHealth as:
"an integrated management of citizens health by use of information technology to support the processes of all healthcare players in special consideration of data protection and data security" [Eine Informations- und Kommunikationsstrategie für ein modernes österreichisches Gesundheitswesen, 2007].

2.1.3. Governance - institutional structures, stakeholder involvement, legal, reimbursement and evaluation issues

- **Administrative responsibility and competence centres**

The main responsibility for the eHealth governance in Austria is in hands of the *"Federal Ministry of Health"* supported by subordinated authorities such as the *"Federal Office for Safety in the Healthcare system"*. The Ministry is responsible for development of principle laws and for the supervision at national level. Given the decentralised governance model in the country, federal provinces are in charge of implementing of legal provisions in their territory [ENISA, 2015].

In Austria, the discussion on eHealth started in 2003 when the so called STRING - Commission (German acronym for *"standards and guidelines for the use of informatics in healthcare"* [Dorda, 2005]) was established as an advisory group for the minister of health [Schweighofer, 2014].

In order to develop the Austrian eHealth strategy, in 2005 it was established a high level coordination committee called the *"Austrian eHealth Initiative"* by the *"Federal Ministry of Health"* and the national working group on data processing. The committee included 100 members from IT companies, eGovernment specialists, insurance groups, chambers of doctors and pharmacists, Ministry of Health, and universities. The objective was to introduce following eHealth services to the healthcare system: EHR, telemedicine services and online health portals. The initiative included seven working groups numbered from AK 1 to AK 7. In the end, their results were summarized to the 2005 eHealth strategy. Moreover, in July 2006 the *"Federal Health Commission of Austria"* set up a task force called the *"Arge ELGA"* with the specific objective of coordinating the electronic health records implementation [Stroetmann, 2011, p. 22].

- **Involving stakeholders**

The following stakeholders defined by the Austrian eHealth strategy take part in the activities connected to eHealth in Austria:

citizens, healthcare providers, management of healthcare facilities, payers, medical scientists, politicians, public [Eine Informations- und Kommunikationsstrategie für ein modernes österreichisches Gesundheitswesen, 2007, p. 15-17].

- **Legal and regulatory facilitators + eHealth Strategy**

Development of eHealth in Austria was conditioned by introduction of several laws amongst which belong for example:

1998 – *„Physicians Act"*,

1998 – *„Hospitals and Sanatoriums Act"* [Schweighofer, 2014],

1999 – *"Social Insurance Act"*,

2000 – *"Data Protection Act"*,

2004 – *"eGovernment Act for a Citizen Card"* ,

2005 - *"Health Reform Act"* [eHealth News, 2007].

Besides these laws, which can be applied on different problem areas, there is also the so called *"ELGA Act"* concentrating exclusively on the question of eHealth. *"The ELGA Act"* (2012) provides the legal framework for functioning of the ELGA system in Austria. It deals with topics like definition of ELGA, *"Widerspruchstellen"*[8], *"Ombudsmanstellen"*[9], data security etc [ELGA Verordnung, 2012].

2007 – eHealth Strategy

The eHealth strategy of Austria (further the Strategy) started to evolve in 2005 with the support of the *"Federal Ministry of Health"* when the *"Austrian eHealth Initiative"* was founded. The first task of this committee was to develop the Austrian's national eHealth strategy. More than voluntary 100 experts were working on this assignment. In November 2005, the first draft of the Strategy was introduced. In 2007, the *"Austrian eHealth Initiative"* introduced the second draft [Pfeiffer, 2010, p. 10].

---

[8] The so called *„Widerspruchstelle"* is a body responsible for acceptation and confirmation of opt – out requests
[9] The so called *„Ombudsmanstelle"* is a body responsible for consulting and helping to citizens in regard of ELGA matters

The legal basis for the Austrian eHealth strategy is the *"Health Reform 2005 Act"* including the *"Health Telematics Act"* aimed at security of an individual´s health data exchange, and the *"E-Government Act"* of 2004 [eHealth News, 2007].

The main objective of the Strategy is to define framework conditions for coordinated long - term development of eHealth in Austria in order to:

- bring the greatest benefits as possible, both for patients and doctors, by implementing information and communication technologies into health care,
- deliver to providers of health services and information systems with recommendations regarding content and technical standards,
- achieve interoperability of information systems and emphasize benefits of eHealth for all stakeholders [Eine Informations- und Kommunikationsstrategie für ein modernes österreichisches Gesundheitswesen, 2007].

Further, the Strategy aims at building of a system which is nation -wide, forward - looking, protects citizen rights, rapid, accessible where it is needed, time independent, low cost, secure, based on uniform technical communication standards, based on substantive documentation standards, takes advantage of the technical and organizational potential privacy and data security measures, provides participants with the important and correct and relevant information for the diagnosis and treatment, prevention and, rehabilitation [Eine Informations- und Kommunikationsstrategie für ein modernes österreichisches Gesundheitswesen, 2007].

In order to achieve these goals, the Strategy sets a roadmap divided in four parts: preconditions, eHealth - Infrastucture/ basic components, eHealth-Use, accompanying measures [Eine Informations- und Kommunikationsstrategie für ein modernes österreichisches Gesundheitswesen, 2007].

Preconditions for the nationwide implementation of eHealth in Austria are the following:

- political consensus,
- establishment of a (long - term) monitoring function and ongoing strategic development,
- transparency in the strategy, planning and implementation,
- defined base architecture,

- standards for the common components and the interfaces between components (according ELGA feasibility study HL7, DICOM - WADO and IHE),

- international developments focusing on the European Economic Area,

- ensuring of financing of e-health infrastructure [Eine Informations- und Kommunikationsstrategie für ein modernes österreichisches Gesundheitswesen, 2007].

Basic eHealth infrastructure is built by the following **components and dependencies among them**:

- Patient identification with Master Patent Index (MPI),

- Healthcare provider identification with directory of health service providers,

- Broadband networking of all actors of eHealth,

- functional portal for all stakeholders of eHealth, in particular healthcare providers and for citizens and patients,

- roles and permissions concept,

- a register of documents ,

- a pseudonymization/ anonymization service [Eine Informations- und Kommunikationsstrategie für ein modernes österreichisches Gesundheitswesen, 2007]

eHealth – applications

The Strategy emphasises making pilots of projects like ePrescriptions, ELGA and eMedical reports and their subsequent evaluation and implementation across the country [Eine Informations- und Kommunikationsstrategie für ein modernes österreichisches Gesundheitswesen, 2007].

Accompanying measures

The Strategy sets several accompanying measures necessary for the use of eHealth services. Among such measures belong for example, monitoring of Austrian eHealth activities, organisation of a conference once a year under the auspices of the Ministry of Health, use of the financing of the European Union, periodic evaluation and development of the Strategy, definition of standards for terminology, catalogues and

content of relevant documents etc [Eine Informations- und Kommunikationsstrategie für ein modernes österreichisches Gesundheitswesen, 2007].

- **Financing and reimbursement issues**

The Federal Government, the federal states and the social insurance companies are responsible for financing of eHealth infrastructure in Austria. Moreover, there is a recurring public budget for eHealth to finance planning activities and pilots.
In order to successfully implement the ELGA system, the Federal Government and the federal states made an agreement that financing of the system has to be guaranteed.
In order to save some costs, the first implemented projects were the electronic health records and ePrescriptions because it was supposed that they will have a cost reducing effect [Pfeiffer, 2010, p. 30].

- **Evaluation activities**

The most important evaluation activity conducted in Austria was the feasibility study by IBM in 2006. This study was dedicated to implementation of ELGA (see the next part of the chapter) and concentrated on benefits that ELGA could bring to Austrian citizens [Pfeiffer, 2010, p. 31].

2.1.4. Deployment of eHealth applications

- **Patient summaries and electronic health records**

Recently, the electronic health records have been very popular topic in Austria. In this country, they are known under the name ELGA which is an abbreviation of the German expression *"Elektronische Gesundheitsakte"*. ELGA is name both for the electronic health records in Austria and the body that coordinates the EHR project. ELGA is legislatively regulated by the *"ELGA Act"* which was adopted at the end of the year 2012 by the Austrian National Council [ENISA, 2015].

It primarily aims at improving of information flows in order to reach high - quality patient - centred care for citizens of Austria [Bundesministerium für Gesundheit, 2013]. ELGA provides the Austrian citizens with the possibility to access their medical records at every time in every place. The first provided data were laboratory and x – ray tests, discharge letters, and medicines with or without prescription. All the public hospitals in Austria should have been connected to ELGA since the end of 2015. Later, other medical facilities should be added. The first facilities connected to ELGA were the public hospitals in Vienna and Steiemark. The first accessed records were laboratory and x – ray tests [ELGA, 2016].

Every federal state is responsible for management of ELGA in its territory and patient data cannot be stored in hosted infrastructures that are not placed in the state [ENISA, 2015]. In every federal state, a so called *"Ombudsmanstelle"* was established, which is responsible for consulting and helping to citizens in regard of ELGA matters. Employees of the ombudsman offices are coordinated through the Federal Ministry of Health [ELGA Verordnung, 2012].

Citizens alone can decide whether or not they want to participate in ELGA – in accordance with the *"opt – out right"*, they can completely or partly cancel their participation [ELGA, 2016]. The membership in ELGA can be managed both electronically via ELGA – Portal at www.gesundheit.gv.at with the mobile signature or citizen card, and per post via so called *"ELGA-Widerspruchsstelle"* which is responsible for acceptation and confirmation of opt – out requests [ELGA Verordnung, 2012]. To the *"ELGA-Widerspruchsstelle"* it is necessary to send a signed form together with the copy of a photo ID. The forms sent per e–mail have to include an electronic signature [ELGA, 2016]. Without clear prove of the identity of the opt-out sender, the request cannot be processed [ELGA Verordnung, 2012]. The employees of the *"Widerspruchstellen"* can be active only when their identity is clearly proved. Further, they are comminnted (with a signature) to discreetness and to follow strict organizational rules [ELGA Verordnung, 2012].

- **ePrescription**

ePrescription in Austria depends from the ELGA platform with eCard serving as key to identify drug interactions at the patient level. This connection was set by the feasibility study conducted by IBM in 2006 which stated that the only possible integrated solution for eHealth services is ELGA [Pfeiffer, 2010]. Since the adoption of the *"ELGA law"*, the *"Main Association of Austrian Social Security Institutions"* has been responsible for its implementation [ecard, n.d.].

Currently, there is no ePrescription system in Austria, neither it isn´t planned. Prescriptions stay paper – based [Schweighofer, 2014].

- **Telehealth (selected projects)**

Regarding telehealth, there have been several pilot projects conducted in Austria since the late 1990s. For example, since 1999, there has been the telemedicine pilot project conduced in Tyrol which was supposed to link the University Clinic of Innsbruck to the district hospital in Reutte. This project focused on the medical specialities of teleradiology, telepathology, teledermatology, teleophthalmology, and teleoncology. With the purpose of avoiding mistakes and ensuring a global view of the project, a Tyrolean *„four column model of quality management"* was introduced [Pfeiffer, 2010, p. 23 - 25].

Other important projects were mainly focused on pacemaker surveillance. The *„H.ELGA IT Platform"* belongs among the most important of them. This project started in 2005. Its objective was to integrate therapy and data management for Cardiac Rhythm Management (CRM). Using H.ELGA as a central CRM data platform and tighting interface with the municipal information systems (KIS) it was able to counter the increasing complexity of therapy management, design processes more efficiently, and safeguard quality of care [Pfeiffer, 2010, p. 23 - 25].

The *„Teledermatologic Network Services for Counselling on Diagnosis of Skin Diseases (TelDermserv)"* which is a global service consisting of 20 providing sites, 200 requesting sites, an academic medical centre, a Cross Border Health Network,

eLearning, and telemedicine capabilities, is the other project which was very important to achieve the best practises in the field of computarisation of eHealth in Austria. The web application *telederm.org* anables to dermatologists and healthcare workers interested in dermatology to look for diagnostic advice in dermatology from a pool of expert consultants [Pfeiffer, 2010, p. 23 - 25].

2.1.5. Infrastructure implementation aspects

- **Electronic health insurance cards (eCards)**

In Austria, the eCard project was started in 2003. Its first users were the medical professionals who were the contract partners of the *"Austrian Social Security"*. Later, hospitals, pharmacies and other health providers were connected to it [Schügerl, 2014].

8,4 million eCards for patients and 32,000 health professional cards were to be released [Schügerl, 2014].

Providing the following services, the eCard for patients helps to save approximately 50 million euro in administrative costs annually [Bugnar, 2010]:

- Checking if the person is insured
- Medication Approval Service which means that a chief physician of the social security approves the funding of certain medication
- Social Security Query Service which allows a doctor to search for a patient´s social security number by entering name and date of birth in case that the patient forgot his card
- Preventive Medical Checkup documentation which makes a documentation of the outcome of a preventive medical checkup for purposes of research
- Electronic Temporary Disability Report which reports that a person is not able to work
- Disease Management Programmes which report the treatment of chronic diseases [Schügerl, 2014].

These data are stored in the operation center of the eCard system and are available after reading of the card on the terminals, which have been installed in hospitals. The

Austrian eCard serves only to identify a patient. It neither stores nor encrypts data [Schügerl, 2014].

The eCard provides three functions. The first function is the authentication of the citizen in the eCard system (so called SV signature). Further, it can be used as an Austrian citizen card (eGovernment signature), and, last not least, it provides the functionality of the European Health Insurance Card (EHIC), which can be also electronically read. This makes the eCard the first card in Austria with a multipurpose use [Schügerl, 2014].

Regarding the functionality of the citizen card, there is to say that it doesn't have a lot of success - only 70,000 cards have been activated for this function so far [Schügerl, 2014].

On behalf of security questions, the eCard can be protected by various types of protection, depending from the use of the card: PIN code, electronic signature, identification sign [ecard, n.d.].

The picture shows what this card looks like.

Fig 2 : eCard Austria [ecard, n.d.]

On the front side of the card, there is the name and title of the insurant, number of the social insurance, and serial number of the card. Moreover, there is the number of the service line and web address of the social insurance company. All of these data are stored on the chip in the card. The letters *"SV"* on the card are a special sign for blind people [ecard, n.d.].

Health professional cards are called oCards in Austria. The *"o"* stands for the word *"ordination"*. oCards are protected by PIN code and every medical practitioner is

entitled to at least two cards [Schügerl, 2014]. These cards work on the so called double-key principle, which means that the medical professional is entitled to look at the patient data only using his own and the patient´s eCard [ecard, n.d.].

This card is pictured in the following figure.
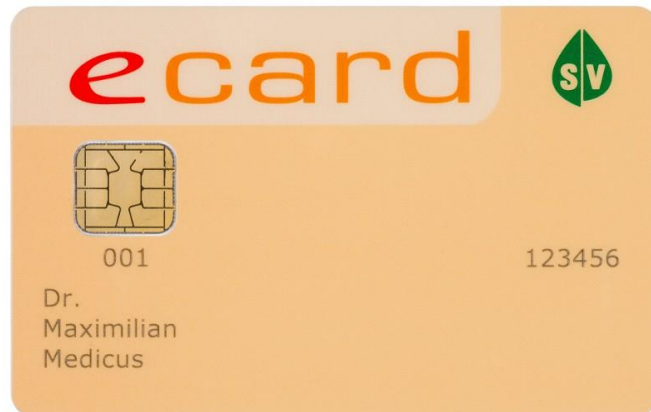
Fig 3: oCard Austria [ecard, n.d.]

- **Standards (technical/semantic)**

In Austria, ELGA GmbH has been charged with responsibilities for assuring technical interoperability and harmonising national standards [Stroetmann, 2011].

There are following European and international standards used in Austria:
HL7, Logical Observation Identifiers Names and Codes (LOINC), DICOM 3.0 and WADO, IHE Patient Care Coordination Technical Framework, IHE Laboratory Technical Framework [Pfeiffer, 2010, p. 22].

2.2. eHealth in Germany

2.2.1. Healthcare system in Germany

The German healthcare system can be characterised with five features: solidarity, benefits in kind, financing from employers and employees, self-administration and plurality [Obermann, 2013, p. 24].

Regarding the principle of self-administration of the German healthcare system, it means that the state delegates the regulation of the system to the so-called associations and leaves itself only in a supervisory and framework-setting role which is shared among the federal government and governments of the 16 states which Germany consists of [Liberman, 2012]. The administration also practices subsidiarity, which means that any problems should be addressed at the level of the most local institution [Obermann, 2013].

Speaking about the institutions, at the top stands the German Federal Parliament, the Federal Government through the Ministry of Health [Liberman, 2012], the Federal Insurance Office, and the Federal Supervisory Office [European Observatory on Health Care Systems, 2000].

The principle of plurality means that patients are able to choose their medical professional and facility. There are 2,100 hospitals, 429,900 doctors, 84,400 dentists and 712,000 nurses available [Obermann, 2013, p. 93].

On behalf of financing, the German healthcare system is sponsored mainly from payments of employers and employees to the Health care Fund. In addition, the federal government supports healthcare in the form of taxes [Liberman, 2012]. Except of some groups of citizens, it is obligatory to be insured in Germany and there is a so-called dual insurance system involving compulsory and private insurance. The amount of money which employees with compulsory insurance pay depends on their income [Obermann, 2013, p. 140-142]. The ones with the private insurance pay the amounts depending on

their age. Simply, 1. The more you earn, the more you pay, 2. The older you are, the more you pay [Germany Health Insurance System, 2016].

The principle of solidarity means that the money in the compulsory insurance system is in accordance with a concept of a welfare state paid to the system and subsequently divided among people that need it. In another words, everybody pays for healing the one in need [Verbraucher Portal, 2016].

The principle of benefits in kind means that direct treatment is provided to beneficiaries without the necessity to pay upfront [Obermann, 2013].

2.2.2. The German definition of eHealth

The German definition of eHealth sounds:

"eHealth refers to the use of modern information and communication media in the healthcare industry. This use ranges from simple sensors that transmit readings via radio to the nationwide electronic networking of different actors in the health sector [Medizin Technologie, n.d.] *".*

2.2.3. Governance - institutional structures, stakeholder involvement, legal, reimbursement and evaluation issues:

- **Administrative responsibility and competence centres**

The Federal Parliament and the Ministry of Health are the main institutions responsible for the creation of the national eHealth policy. At the level of federal states, each of the states has its own Ministry of Health, which can be also responsible for other policy fields, for example social affairs [Stroetman, 2010, p.9].

"gematik", which is the abbreviation of the German expression *"Gesellschaft fuer Informatik"*(Company for telematics), is the structure under the legal supervision of the

Federal Ministry of Health. It is responsible for numerous activities regarding the implementation of the eHealth card and telematics infrastructure [Liberman, 2012, p. 18].

- **Involving stakeholders**

The execution of eHealth policy in Germany is in the hands of the so-called self-administration bodies involving hospitals, pharmacies, dentists, insurances,... In case that they are not able to agree on something, the Ministry can set a final date until when the agreement has to be made and specify details of execution [Stroetman, 2010, p. 18].

- **Legal and regulatory facilitators**

Development of eHealth in Germany was conditioned by introduction of several laws among which belong for example:

(2003) *" Law for the Modernisation of Statutory Health Insurance"* [Liberman, 2012],

(2003) *„Law for Modernisation of the German Healthcare System"* [Stroetmann, 2010]

(2016) *"eHealth Act"*

(2015) *"IT- Security Act"* [Liberman, 2012, p. 18].

eHealth Act (2016)

The aim of the *"eHealth Act"* in Germany is *"to form the basis for profitable applications of the electronic healthcare card, the establishment and opening of the telematics infrastructure, the improvement of interoperability and the promotion of telemedicine applications"* [Liberman, 2012, p. 18].

The German eHealth strategy (2005)

The German eHealth strategy was introduced by the *"Federal Ministry of Health and Social Security"* in 2005. In the Strategy, the Ministry formulates its policy intentions and perspectives of the statutory legal provisions in non-juridical language [eHealth News, 2007].

The Strategy sets three main goals:

Firstly, it aims at enabling communication among all relevant health professionals (hospitals, health insurance companies, practitioners etc.). Secondly, it concentrates on cross-linking of the professionals and exchange of all relevant medical documentation and data. Last but not the least, it targets creating an electronic patient record system with a lifelong medical history for every patient [Germany: Healthcare system and eHealth strategy, n.d.].

The strategy is based on two pillars.

The first pillar is represented by an ICT infrastructure which is financed by one or more high-volume, ubiquitous applications, which enable other applications to build upon the infrastructure without bearing the basic costs. Specifically, it applies to:
online verification of insurance status (mandatory for citizens) including availability of all data for an electronic European Health Insurance Card (eEHIC), electronic transmission of drug prescriptions (mandatory), and drug interaction and contraindication checks (voluntary for the insured) [eHealth News, 2007].
The second pillar seeks to implement a private electronic patient record (ePR) and other applications using the already - established infrastructure [eHealth News, 2007].

- **Financing and reimbursement issues**

Financing of „*gematik*" is treated by a contract among its owners – *"contractual partners of the self – administrated healthcare system at the federal level"* [Stroetman, 2010, p. 38]. Except for the financing of gematik, also the financing process of the initial set – up from the infrastructure, its operational phase and infrastructure

investments in hospitals, are treated in this contract. Although the regulations set by the contract are complex, they are obligated to follow certain rules [Stroetman, 2010, p. 38].

- **Evaluation activities**

Amongst the most important German evaluation activities, definitely belongs the so called *"Verordnung über Testmassnahmen für die Einführung der elektronischen Gesundheitskarte"* (EGKTEstV) *("Regulation on tests measures for the implementation for the electronic health card")* - from 2005 - which has already been adapted to specific test developments for several times [Stroetman, 2010, p. 39].

According to this regulation, the telematics infrastructure required for the introduction and use of an electronic health card should be reviewed and further developed using experimental measures. In particular, these measures include testing of functionality, interoperability, compatibility, stability, security and practicality of the individual components and services, their interaction within the telematics infrastructure, its acceptance by insurants as well as its effects on healthcare [Verordnung über Testmassnahmen für die Einführung der elektronischen Gesundheitskarte, 2005].

Testing should include mainly the following components and services:
The electronic health card, the electronic health professional card and the electronic professional card, card readers, the connection of systems of service to the telematic infrastructure (connector, access network), components and services to the central network infrastructure, sectoral and cross - sectoral technical services and their interfaces to the telematics infrastructure, services to support users, technical facilities for insurants to defend their rights [Verordnung über Testmassnahmen für die Einführung der elektronischen Gesundheitskarte, 2005].

2.2.4. Deployment of eHealth applications:

- **Patient summaries and electronic health records**

Electronic health records are in Germany known under several synonyms: *„elektronische Krankenakte", „digitale Patientenakte", „elektronische Gesundheitsakte"*, electronic health records, electronic patient records [Dugas, 2003].

In Germany, electronic health records belong, together with the eCard, among the basic concepts of the eHealth strategy. They are understood as a *"voluntary citizen - managed, personal electronic health record"* [Stroemann, 2010, p. 31 - 36], offered and operated by the healthcare system.

The data in the electronic health records will usually be provided to healthcare professionals in the form of electronic copies of original documentation. Citizens will access and manage the data with the help of an eCard.

Regarding security questions, cryptographic techniques like authentication and (qualified) digital signatures between infrastructure components are used. To read the encrypted data, a private key, stored on the eCard, must be utilized by the user himself.

Applications included in EHR are divided in two outcomes; mandatory and voluntary [Stroemann, 2010, p. 31 – 36].

Amongst the mandatory applications belong the eventual online updates of insurance status, recording of mandatory co - payment status, and the data set of the European Health Insurance Card [Stroemann, 2010, p. 31 - 36].

Voluntary applications concern: emergency data set, electronic physician letter transfer of various messages on test results, diagnoses, suggested therapies, transmission of electronic prescriptions to a pharmacy, full documentation on all prescribed or otherwise purchased or taken drugs, electronic patient record, integration of data supplied by the patient or third parties [Stroemann, 2010, p. 31 - 36].

- **ePrescription**

The idea of the Electronic Health Records and ePrescriptions in Germany is embedded in the concept of the electronic health card [Esante, 2013]. However, currently there are no plans to implement ePrescriptions [European Commission, 2014].

- **Telehealth (selected projects)**

Just as in Austria, mainly local telemedicine projects were conducted in Germany. Amongst such projects belongs for example the large scale project by the *"Institut für angewandteTelemedizin" (IFAT)* at the *"Heart und Diabetes Centre Bad Oeynhausen"* in North Rhine - Westphalia focused on the monitoring of chronic diseases. The centre, together with its partners in Luxembourg, focuses on the use of telemedicine to treat heart failure patients [Stroetmann, 2010, p. 27-30].

Further, in Bavaria, there was a tele-medical network in two specialized stroke centers and 12 regional hospitals founded in order to *„provide modern stroke management and advanced stroke expertise in non-urban areas"* in 2003 [Stroetmann, 2010, p. 27-30].

In frame of the project called *„AGNES"(„Arztentlastende, GemeindeNahe, E-healthgestützte, Systemische Intervention")*, general practitioners are supported with qualified medical practice personnel who rely on the fact that patients are supported by tele-health applications [Stroetmann, 2010, p. 27-30].

To promote telemedicine, teleconsiliary diagnosis evaluation of radiographs and the online video consultation will be included in the contractual medical care approach from July 2017. This will considerably simplify communication between patients and their doctors, especially in aftercare and preceding structural medical checkups [Das E-Health-Gesetz, 2015].

2.2.5. Infrastructure implementation aspects:

- **eCards**

eCards *(„eHealth Cards", „elektronische Gesundheitskarten", „eGK", „eHC")* are regarded as the most important project with the aim to modernize German healthcare. They were introduced in October 2011, replacing the old insurance health cards which had been used since 1995. Since the beginning of 2015, only new eHealth Cards have served as the relevant proof of insurance [Liberman, 2012, p. 18-19].

Connecting 80 millions of insured citizens, 35,000 doctors, 22,000 pharmacies, 2,200 hospitals and 300 insurance companies, the cards significantly help to save costs for the issuing of recipes, decrease risk of medical errors and the misuse of insurance cards. Moreover, the card gives an opportunity for patients to look privately at their medical data [Mentzinis, 2007].

The card has two functions. The first of them is the obligatory administrative part about insurance (it has the functionality of the previous insurance card), status of payment and information about prescriptions. It has also functionality of the European health insurance card [Mentzinis, 2007].

The second, optional, is the medical functionality. It contains health relevant information like information about allergies, drug intolerance, chronic diseases, emergency data or data which can be made available by the insured person alone [Mentzinis, 2007].

The figure nr. 4 pictures how the German eHealth card looks like [Liberman, 2012]:
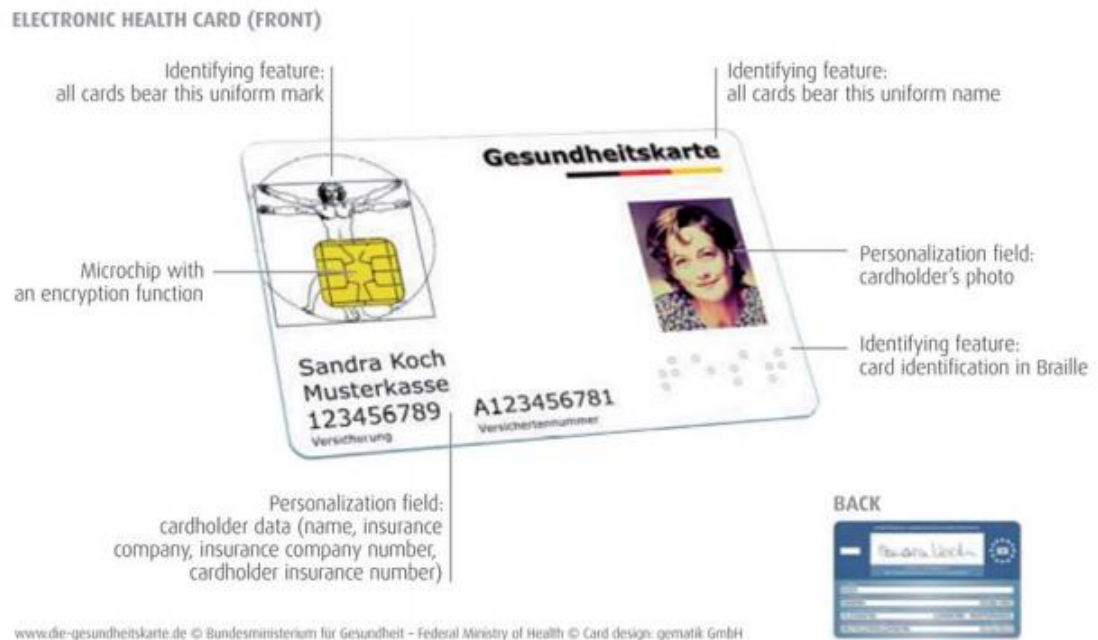
Fig 4 : eCard Germany [Liberman, 2012]

The microchip placed in the card includes encrypted administrative and medical data. The picture of the cardholder is printed on the card to simplify identification. The back side of the card serves as the classical European Health Insurance Card [Liberman, 2012, p. 18-19].

In order to read the eHealth cards, specialized terminals for eHealth cards were installed in healthcare facilities. These installations were financed by insurance companies [Liberman, 2012, p. 18-19].

Except of eHealth cards, also health professional cards were introduced in Germany. These are person specific identification cards which enable health professionals to approach the electronic patient data card and the telematics platform. Moreover, with the help of this card the doctor is also able to sign an electronic prescription for the patient [Federal Ministry of Health, 2015].

The card is pictured in the figure nr. 5 [Federal Ministry of Health, 2015].

Fig 5: Health professional card in Germany [Federal Ministry of Health, 2015]

The implementation of eCards and ePrescriptions is only the first step in the modernization of the German health caresystem. Subsequently, voluntary patient records should be introduced allowing storage of radiographs, ultrasounds, lab reports, and discharge letters [Mentzinis, 2007]. In this topic Germany is a few years behind Austria. In 2015 the first introduced applications were; *''insured master data alignment''* and *''the qualified electronic signature''*[Aerzteblatt, 2013].

- **Standards (technical/semantic)**

"The German Institute of the medical documentation and information" is the authority reasponsible for maintenance of semantic standards in Germany. The so called LOINC, OID and ICD-10-GM/Alpha-ID are very important instruments for semantic interoperability provided by this institute. However, using of standards still represents a problem for Germany as they are not used nationwide on regular basis [Stroetman, 2010, p. 36].

2.3. eHealth in Switzerland

2.3.1. Healthcare system in Switzerland

Healthcare system in Switzerland can be characterized as an unique combination of public, subsidised private and totally private healthcare system.

Unlike the previous systems, healthcare in Switzerland is not financed through employer/employee payments and taxes but through payments of individuals. Every year, adults have to pay the so called *"excess"* CHF 300. This means that CHF 300 of any treatment they pay alone. The insurance covers the amount exceeding CHF 300 and even from this the insurant has to pay 10%. For the stay in a hospital, the patient pays CHF15 per day. The inhabitants of Switzerland can choose the insurance company (60 companies in the market) and a supplementary insurance, too. This suggest a great competition at the level both providers and payers [Expatica, 2016].

26 Swiss cantons are in charge of planning and delivery of health services, providing of subsidies for insurance premiums and partial financing of hospitals. The central government is responsible for federal health legislation, regulation of insurance market and approving of the payment mechanism. As the government of Switzerland is based on direct political participation, any change in the policy can be subject to popular vote. Lobby groups (pharmaceutical industry, insurance companies, healthcare providers) are strongly linked to the National Parliament, what slows down the pace of health reforms [Biller - Andorno, 2015].

Regarding number of medical facilities and professionals, there are 300 hospitals, 30, 327 physicians, and 133, 697 nurses active in Switzerland [Hospitals in Europe, 2011].

2.3.2. eHealth definition in Switzerland

The eHealth definition in Switzerland sounds:

„the integrated use of information and communication - technologies (ICT) to design , support and network all processes and participants in health care"[ehealthsuisse, 2015]
.

2.3.3. Governance - institutional structures, stakeholder involvement, legal, reimbursement and evaluation issues:

- **Administrative responsibility and competence centres**

Switzerland is a very peculiar country. It includes *"many languages, many legal frameworks and political organizations, different cultures and understandings"*[eHealth Switzerland, 2015]. Because of this, the implementation of eHealth is more analogous to eHealth implementation in the European Union as a whole, than to its implementation in any other EU country [ehealthsuisse, 2015].

The main responsibilities for eHealth are in the hands of the Federal Council and the Parliament, specifically by the *"Swiss Federal Office of Public Health (FOPH)"* which is a part of the *"Federal Department of Home Affairs (FDHA)"*. Among these responsibilities belong mainly drafting and passing laws [Schmid, 2010, p. 15-16].

Similarly, like with other governmental topics in Switzerland, wide - ranging competences are held by cantons and hence a regular dialogue on eHealth matters and coordination is needed. The main body governing eHealth in Switzerland is a coordination body called *"eHealth Suisse"* financed by the federal state and the GDK (Swiss Conference of the cantonal Health boards). *"eHealth Suisse"* is represented by the steering committee. In the advisory board, numerous stakeholders including patients are present. The coordination body is supposed to organize processes and provide sustainability and coherence regarding eHealth. Regarding the Swiss political structure,

national projects are preferably not coordinated by the eHealth coordination office, but by the regional and cantonal approaches [ehealthsuisse, 2015].

- **Involving stakeholders**

Following eHealth stakeholders can be defined: professional groups such as the Swiss Federation of physicians, of nurses, of pharmacists, of medical informatics; 26 ministries of health, academy of medical science, universities, high schools, patients [ehealthsuisse, 2015].

- **Legal and regulatory facilitators**

„Federal Act on Data Protection" (1993)
„National Health Insurance Act" (1994)

Federal act about electronic health records (2015)

The *"Federal act about electronic health records"* 2015 (efficient since 2017) provides the legal framework for functioning of the Patientendossier system [ehealthsuisse, 2015].

eHealth Strategy 2007

The Swiss eHealth strategy represents needs and requirements of each of the Swiss' 26 cantons. It bases on a revision of the *"Strategy for an information society in Switzerland"* which was introduced in 1998. eHealth is treated concretely in the chapter *"Health and health services"* which was added to this strategy in 2006 after an evaluation by the *"Centre for Research and Technology Studies"* in 2002. The official eHealth strategy of Switzerland was approved by the government in 2007 referring to the plan for a national strategy by the *"Federal Department of Home Affairs (FDHA)"* submitted at the end of 2006 providing information about the objectives, the hand - lung areas, the costs, the partnerships, the procedures and the schedule [Strategie „eHealth" Schweiz, 2007]. The Strategy was prepared under a joint project of the *"Federal Office*

of Public Health (BAG)", the *"Federal Office of Communications (OFCOM)"* and the *"Health Directors' Conference"* (GDK) [Strategie „eHealth" Schweiz, 2007]. The so called *"eGovernment Strategy"* is the other important document dealing with the topic of eHealth. It sees eHealth *"as one key factor to keep pace with international competition"* [ehealthsuisse, 2015].

The strategy was prepared as a reaction to the changing situation in healthcare demanding increased efficiency. The main characteristics changing in the population were: aging population, rising income and educational level, rising healthcare costs - requiring the best healthcare provision with limited resources, new diagnostic and treatment methods, changing behaviour and movement of people, internet as an important information source which increases tendency of people towards self – treatment [ehealthsuisse, 2015].

The Swiss eHealth strategy is devoted to three main topics: implementation of the Strategy, electronic Patienterdossier and online – services. For each of these areas, the basic objectives were set. In the following text, objectives of the *"implementation of the Strategy"* problematic are summarised. Other two topics will be discussed later [Strategie „eHealth" Schweiz, 2007].

Implementation of the Strategy

1) Start of the operation of the the national coordinating body for eHealth by the end of 2007.

2) Involvement of all the actors in the health system in the process of implementation of the Strategy by the end of 2007.

3) Resolution of crucial legal issues by the end of 2008.

4) Process of gradual development and expansion of a national "eHealth" architecture to be defined by the end of 2008.

5) Defining of framework for partnerships between the public and the private sector regarding healthcare by the end of 2008.

6) Establishment of process of evaluation of domestic pilot projects in the field of eHealth by the end of 2008.

7) Ensuring that a rapid transfer of domestic and foreign research resulting from science and industry will take place by the end of 2008.

8) Since the beginning of 2009 stages and functional training measures exist for those working in the health system.

9) Including eHealth to basic education of all healthcare related jobs by the end of 2013.

10) People in Switzerland are capable to handle their health and disease-related information and personal data [Strategie „eHealth" Schweiz, 2007].

- **Financing and reimbursement issues**

Cantons are responsible for financing of healthcare and eHealth in Switzerland from their own budgets. Furthermore, some of cantons participate in international projects and receive international financial support, f. e. the canton of Basle (EU Netc@ards project) and the University Hospital of Geneva (debugIT (FP7)/ @neurist (FP6) [Schmid, 2010].

For financing of the *"eHealth Suisse"* the federal state and the *„Swiss Conference of the cantonal Health boards (GDK)"* are responsible [ehealthsuisse, 2015].

- **Evaluation activities**

There have been several evaluation activities for eHealth conducted in Switzerland so far. One of the responsible bodies is the *"eHealth Suisse"*. Specifically, it was obligated to evaluate pilot projects at the cantonal level. One of the main criteria for evaluation of such projects is their conformance with recommendations from the Swiss eHealth strategy. Moreover, cantons alone are responsible for evaluating of pilot projects in their area [Schmid, 2010, p. 22].

One of the most important evaluation projects was the cost – benefit analysis of the eCard that was introduced in 2010. The study showed that benefits of eCard introduction were higher than its costs [Schmid, 2010, p. 22].

2.3.4. Deployment of eHealth applications:

- **Patient summaries and electronic health records**

In Switzerland, electronic health records are called *"Patientendossier"*. Their introduction was the basic aim of the Swiss eHealth strategy and they are regulated by the *"Federal act about electronic health records"* from 2015.

The Strategy provides the following definition: *"The electronic patient dossier is the patient-moderated, lifetime collection of all personal medical, preventive, nursing and administrative data available. Among other things, the electronic patient file contains the individual's medical history, important laboratory findings, operation reports and x - rays and digital data from other studies. Clinics and healthcare professionals to obtain a controlled access to the electronic patient dossier with the consent of the patient. Access to electronic patient dossier is made possible through an appropriate authentication mechanism"* [Strategie „eHealth" Schweiz, 2007].

Electronic Patientendossier should replace paper based health records. According to the Swiss eHealth strategy, they were planned to be disposable until 2015. Recently, EHR was implemented in various pilot projects in several cantons, especially in Geneva. Most of these projects are facing difficulties now due to the federal system, the lack of both integration and incentives of doctors, lack of standardization. Regarding the private basis, EHR does not meet a lot of trust among patients and doctors.

It has not been exactly defined yet, as to which data will be accessible through Patientendossier. However, the patient can look at the data and choose which data can be provided. There have been several systems established to provide patients with their personal health data: insurance driven (run by the insurance company KPT, centralized and automatically updated by the insurance company), driven by a telecommunication company (updated directly by patients) and two pharmacy driven systems. A central data storage has been missing so far. None of the projects has had much success – patients don´t seem to be enthusiastic about them.

The following plan for the implementation of Patientendossier was set forth by the Strategy:

1) **Definition of standards for an electronic extract of treatment - relevant information (Electronic Patient Record Summary, Continuity of Care Record) from the personal medical history which represents an actual health status of the patient until the end of 2008**

2) Introduction of electronic health insurance card with optional personal and health information

3) Performance of tests of eHealth services on the basis of the insurance card model by cantons since 2009

4) Establishment of the possibility of secure authentication and electronic signature for all the service providers by the end of 2010

5) Establishment of the possibility of secure authentication and electronic signatures for all the people in Switzerland by the beginning of 2012

6) Establishment of the electronic transmission of structured medical data protected from loss, among the participants in the healthcare system by the end of 2012

7) All people in Switzerland to be provided with their treatment - related information independent of place and time ("Electronic Patient Dossier") by the end of 2015 [Strategie „eHealth" Schweiz, 2007].

- **ePrescription**

There are several actors who have already started with the project of ePrescription, both at regional and national level. Communication among them is only partial [ehealthsuisse, 2015].

In Agenda *"Gesundheit2020"* the Federal Council identifies a concrete action towards the *"Introduction and active promotion of eMedikation"* in 2013. The Steering Committee of *"eHealth Suisse"* introduced at its meeting in August 2014 a possible plan of action and instructed the project management of *"eHealth Suisse"* to take over the active coordination of action and to establish a platform for relevant stakeholders [ehealthsuisse, 2015].

- **Telehealth**

Following telemedicine applications are currently used in Switzerland:

National telemedicine applications:
- *„Teleconsultation (doctor-to-patient)*
- *Teleconsultation or videoconferences between health professionals*
- *Call centres for patient information/care by health insurance companies*

Canton-based applications:
- *Canton-dependent applications*
- *Remote consultation or videoconferences between health professionals –*
- *cantons of Basle, Jura and Tessin; including telepathology and teleradiology –*
- *cantons of Schaffhausen, Uri and Tessin*
- *Mobile telehealth – canton of Wallis and Basle*
- *Remote consultations and eVisits – canton of Basle"* [Schmid, 2010, p. 20]

Two main challenges regarding further deployment of telemedicine activities in Switzerland are represented by the lack of a national programme coordinating telemedicine services and the lack of consensus between public and private actors in eHealth [Schmid, 2010, p. 20].

2.3.5. Infrastructure implementation aspects:

- **eCards**

In Switzerland, eCard was introduced in 2010, with the main purpose of being used as a healthcare identification card. The card contains a chip with administrative and medical emergency data of a patient according to his selection. These data are not simultaneously saved on a server. Because of the security reasons, the card can be protected by a pincode set by the patient. Moreover, the patient can choose which healthcare professionals have access to his/her data. A login and password is provided to these professionals. It is obligatory for these healthcare professionals to possess a healthcare professional card due to card – to – card authentication [Schmid, 2010, p. 22-23].

Regarding the health professional card in general, it has been distributed since 2009. Its ownership is optional [Schmid, 2010].

The main challenge to the implementation of eCards in Switzerland is to persuade all the healthcare stakeholders. The data from surveys even show that the more general practitioners are in favour of the eCards, the more patients are in favour, too [Schmid, 2010, p. 22-23].

In the picture it is possible to see how this card looks like.

Fig 6: eCard in Switzerland [ehealthsuisse, 2015]

Other than the already mentioned chip, it contains - in print - administrative data like name and date of birth of the insurant, serial number of the card, number of the insurant, date until when the card is valid [Schmid, 2010].

- **Standards (technical/semantic)**

Except of the sub – group of eHealth Suisse on standards and architecture which coordinates formulation of standards by several professional associations, currently, there is no formal authority responsible for formulation of standards and recommendations [Schmid, 2010, p. 19].

Currently used standards in Switzerland are:

IHE specifications: XDS, PIX/PDQ, XUA

ebXML as web service profile [Schmid, 2010, p.19].

2.4. Comparison

In spite of the fact, that these countries are similar in many aspects – language, geographical location, federal government – they differ a lot in organization and progress in the field of eHealth and to compare them is not one of the easiest tasks. In the following section, the comparison will be conducted in accordance with the analysis conducted before.

As the comparison is based exclusively on the information already mentioned in the previous chapters, there are no more literature references provided in this part of the chapter.

2.4.1. Governance - institutional structures, stakeholder involvement, legal, reimbursement and evaluation issues

- **Administrative responsibility and competence centres**

In all of the analyzed countries, the responsibility for eHealth lies largely with the Ministry of Health and its subordinated offices. As all of the states have the federal structure, wide – ranging competencies are left to federal states/ cantons which increases the need for establishment of a coordination body. In order to coordinate eHealh activities, three main coordination organs under supervisions of the Ministries of Health were established:

The *"Austrian eHealth Initiative"* in Austria*, "gematik"* in Germany*, "eHealth Suisse"* in Switzerland.

	Coordination body	**Year of establishment**
Austria	Austrian eHealth Initiative	2005
Germany	gematik	2005
Switzerland	eHealth Suisse	2008

Tab 1: Coordination bodies for eHealth [author, 2016]

- **Involved stakeholders**

Rather than naming the stakeholders in eHealth in all of the states, it would be better to concentrate on the problems connected to them.

The conducted analysis shows that in all the states, there are difficulties with introduction of eHealth solutions because of unwillingness of some of the eHealth stakeholders.

Specifically, in Austria, the implementation of ELGA is negatively influenced by the fact that physicians don´t agree with its implementation. Similarly, the functionality of the citizen card in Austria, and the eCard in general in Switzerland are facing to low trust levels from patients. In Switzerland, observations suggest that the more medical professionals are willing to use eCard, the more patients trust in these cards.

To conclude, the analysis shows that in order to reach a desirable state of eHealth in a country, it is essential to establish cooperation among all of its stakeholders.

- **Legal and regulatory facilitators/ eHealth strategy**

In all the analyzed states, there were laws introduced exclusively concentrating on the problematic of eHealth.

The Austrian *"ELGA Act"* (2012) provides the legal framework for the functioning of the ELGA system. The *"eHealth Act"* (2016) in Germany aims at the forming of *"the basis for profitable applications of the electronic healthcare card, the establishment and opening of the telematics infrastructure, the improvement of interoperability and the promotion of telemedicine applications"* [Liberman, 2012]. The Swiss *"Federal act about electronic health records"*(2015) provides the legal framework for functioning of the Patienterdossier system.

eHealth strategies

All of the analyzed countries are in possession of the official eHealth strategy for nine years, or more.

The Swiss eHealth strategy (2007) is devoted to three main topics: implementation of the Strategy, electronic Patienterdossier and online services. For each of these areas, it sets detailed objectives for their implementations.

The Austrian eHealth Strategy (2007) sets a roadmap for development of eHealth divided in four parts: preconditions for development of eHealth, eHealth - Infrastructure / basic components, eHealth-Use, and accompanying measures.

The German strategy (2005) is based on two pillars: The first one is represented by an ICT infrastructure financed by one or more high - volume, ubiquitous applications which enables other applications to build on the infrastructure without bearing the basic costs. The second one seeks to implement a private electronic patient record and other applications using the already - established infrastructure.

	Existence of eHealth legislation	Laws
Austria	yes	*"The ELGA Act"* (2012)
Germany	yes	*"The eHealth Act"* (2016)
Switzerland	yes	*"The Federal act about electronic health records"*(2015)
	Existence of the Strategy	**Year of introduction of the Strategy**
Austria	yes	2007
Germany	yes	2005
Switzerland	yes	2007

Tab 2: eHealth laws and strategies [author, 2016]

- **Financing and reimbursement issues**

eHealth is in all three countries financed mainly from public budgets. However, there are some differences worth of mentioning.

Austria unlike the most of the European countries owns a recurring public budget for eHealth to finance pilots and planning activities. Moreover, there is a project – based financing. There was an agreement made by the Federal Government and the federal states in purpose to implement the ELGA system. The agreement says that financing of the system has to be guaranteed.

While *"eHealth Suisse"* and *"eHealth Initiative"* are financed by governments, in Germany, financing of *gematik* is treated by a contract among its owners – *"contractual partners of the self – administrated healthcare system at the federal level"* [Stroetman, 2010] which specifically means the umbrella organizations of care providers and payers in the German healthcare system. Except of financing of gematik, also financing of the initial set – up of the eHealth infrastructure, its operational phase and infrastructure investments in hospitals are treated in this contract.

In Switzerland, cantons alone are responsible for financing of eHealth in their territory. For financing of *"eHealth Suisse"*, the federal state and the GDK (Swiss Conference of the cantonal Health boards) are responsible.

- **Evaluation activities**

The attitude towards evaluation activities connected to eHealth is slightly different in all of the analyzed states.

In Austria, a feasibility study by IBM in 2006 was the most important conducted evaluation activity. This study was dedicated to implementation of ELGA and concentrated on benefits that ELGA could bring to Austrian citizens.

In Switzerland, the *"eHealth Suisse"* is responsible for evaluation of pilot projects at the cantonal level. One of the main criteria of evaluating of such projects is their

conformance with recommendations from the Swiss eHealth strategy. For one of the most important evaluation activities conducted in Switzerland is possible to consider the 2010 cost – benefit analysis of eCard.

In Germany, *"Verordnung über Testmassnahmen für die Einführung der elektronischen Gesundheitskarte"* (EGKTEstV) *("Regulation on tests measures for the implementation for the electronic health card")* from 2005 is consider for one of the most important evaluation activities. This Regulation defines measures for testing of eCard infrastructure.

2.4.2. Deployment of eHealth applications

- **Electronic health records**

Based on the eCard infrastructure, Austria has been consistently developing a nationwide electronic health record (ELGA: a cross - organizational information system in which relevant patient – related medical information are made available to the doctors involved in treatment) for several years. In order to coordinate and operate the project, the ELGA GmbH, which is owned by the federal state and social security owners, was founded. ELGA is regulated by the *"ELGA – law"* adopted in 2012. In the end of 2015, all the public hospitals in Austria were connected with ELGA.

Introduction of electronic health records in Germany met more difficulties and it was postponed until indefinite time. The first introduced applications were in 2015 applied qualified electronic signature and equalization of basic insurance data.
In spite of the fact that there is no nation – wide telematics infrastructure available yet, EHR are used in several local projects. Because of the missing nation – wide regulation and insufficient communication, there have being introduced various EHR solutions concurrently.

According to the Swiss eHealth strategy, the Patienendossier was planned to be disposable until 2015. Recently, EHR is implemented in various pilot projects in several cantons, especially in Geneva. Most of these projects are challenging difficulties now

due to the federal system, the lack of both integration and incentives of doctors and lack of standardsation. Regarding the private basis, EHR don´t meet a lot of trust among patients and doctors. Regarding legislation, it is regulated by the *"Federal act about electronic health records"* from 2015.

	Nation – wide solution of EHR	Year of implementation of the nation – wide solution	EHR law	EHR coordination body
Austria	yes	2015	ELGA – law (2012)	ELGA GmbH
Germany	no	Postponed until undefinit	no	no
Switzerland	no	planned by 2015 but the implementation is struggling now	Federal act about electronic health records (2015)	eHealth Suisse

Tab 3: EHR [author, 2016]

- **ePrescription**

ePrescriptions aren´t used in any of the analyzed countries. In Switzerland, there are plans for their implementation, in Austria and Germany it isn´t even planned.

- **Telehealth**

In all of the three countries, there haven´t been any telemedicine projects conducted at the wide – national level. There have only been telemedicine activities at levels of cantons and federal states. Most of them were in the form of pilot projects.

2.4.3. Infrastructure implementation aspects

- **eCards**

There is eCard used in all the analyzed countries. In Austria it is used since 2005, in Germany since 2011 and in Switzerland since 2010.

Although the basic concept is similar in all the countries, there are many differences in the concrete solutions: in administrative questions, questions of functionality, technical questions and design.

Regarding functionality, all of three versions are obligatory used as insurance cards. There is no medical function of the card enabled in Austria and optional medical function of the card in Germany and Switzerland. The function of the European Insurance Card is obligatory in all the countries. Except of the functionalities which have been already mentioned, in Austria, eCard is also used as the citizen card although this function doesn´t have a lot of success among the users of the cards.

The biggest difference in the question of design of the card is the fact the German version includes a photo of the insurant and because of this fact enables visual identification, the Austrian and Swiss version don´t.

Regarding the technological solution, the eCard in Austria doesn´t contain any medical information about the insured person. Its main functionality is to serve as an electronic access key for authentication in the healthcare system. The microchip placed in the German and Swiss versions of eCard includes encrypted administrative and medical data of a patient according to his selection.

In all the countries also the healthcare professional cards were introduced.
In Switzerland, the patient can choose which healthcare professionals can access to his/her data. A login and password is provided to these professionals. For this reason, it is obligatory for these healthcare professionals to possess a healthcare professional card due to card − to − card authentification. However, in general, it is optional for a

healthcare professional to own the professional card in Switzerland. In Austria, the use of health professional card is obligatory and all medical professionals are entitled to at least two cards. The principle of the card – to – card identification works there, too.

Administrative questions

	Existence of e – card for patients and professionals	Year of its introduction	Obligatory use of the card by patients	Obligatory use of the card by healthcare professionals
Austria	yes	2005	yes	yes
Germany	yes	2011	yes	yes
Switzerland	yes	2010	yes	no

Tab 4: eCards – administrative questions [author, 2016]

Functionality

	Insurance card function	Medical function (the card includes medical data)	Functionality also like European Health Insurance Card	Other functionalities
Austria	yes	no	yes	Citizen card
Germany	yes	optional	yes	no
Switzerland	yes	optional	yes	no

Tab 5: eCards – functionality questions [author, 2016]

Technical solution

	Storing data on the card	Visual identification		
Austria	no	no		
Germany	yes	yes		
Switzerland	yes	no		

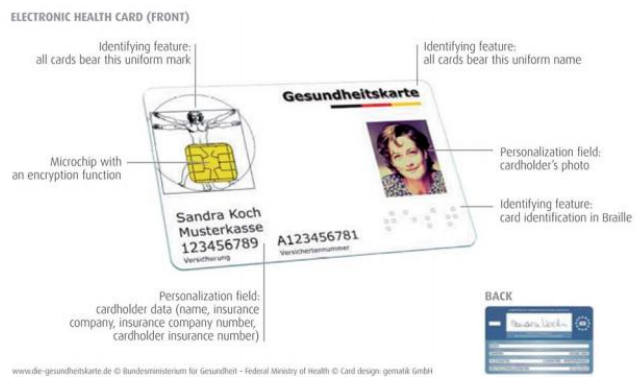**Tab 6:** eCards – technical questions [author, 2016]

Design

- eCard Austria

- eCard Germany

- eCard Switzerland

Schweizerische Krankenversicherungskarte KVG
Carte suisse d'assurance-maladie LAMal
Tessera svizzera d'assicurazione malattie LAMal
Carta svizra da l'assicuranza da malsauns LAM

sana cur Krankenkasse

Muster, Hanna
Name, Vorname/Nom, prénom/Cognome, nome/Num, prenum
8075601562 02452130 19   12345   756.1234.5678.90
Karten-Nr./N° carte/N. carta/Nr. da la carta   BAG-Nr./N° OFSP   AHV-Nr./N° AVS/N. AVS/Nr. AVS
N. UFSP/Nr. UFSP
10.03.1964 W   31.12.2011
Geburtsdatum, Geschlecht/Date de naissance, sexe   Gültig bis/Date d'expiration
Data di nascita, sesso/Data da naschientscha, schlattaina   Data di scadenza/Data da scadenza

- **Standards (technical/semantic)**

The countries vary in types of the authorities responsible for standardisation in the area of eHealth. In Austria, the ELGA GmbH, which is the organization established to introduce the electronic health record system, has been charged with this responsibility. In Germany, the *"German Institute of the medical documentation and information"* is responsible for the introduction of semantic standards. In Switzerland, the responsibility for standardisation is in hands of the sub – group of eHealth Suisse on standards and architecture.

	Organisation responsible for standardization	Used standards
Austria	ELGA GmbH	HL7, Logical Observation Identifiers Names and Codes (LOINC), DICOM 3.0 and WADO, IHE Patient Care Coordination Technical Framework, IHE Laboratory Technical Framework
Germany	The German Institute of the medical documentation and information	LOINC, OID and ICD-10-GM/Alpha-ID
Switzerland	sub – group of eHealth Suisse on standards and architecture	IHE specifications: XDS, PIX/PDQ, XUA ebXML as web service profile

Tab 7: Standards [author, 2016]

3. eHealth Czech Republic

As it is supposed that most of the potential readers of this thesis are familiar with the functioning of the Czech healthcare system, the part with its description isn´t included in this chapter.

3.1. eHealth definition

In the document called the *"Recommendations for a strategy of e-health (eHealth) in the Czech Republic"*, eHealth is defined as *"evolving area at the intersection of medical informatics, public healthcare and business related to medical services information provided via Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also way of thinking, attitude and participation in the interconnected global thinking to improve medical care on a local, regional and global level by using information and communication technologies"*. [Doporučení pro strategii elektronického zdravotnictví (eHealth) pro Českou republiku, 2012].

3.2. Governance - institutional structures, stakeholder involvement, legal, reimbursement and evaluation issues

- **Administrative responsibility and competence centres**

In the Czech Republic, the responsibility for eHealth lies largely with the Ministry of Health. However, there was no comprehensive operational program or a separate priority axis covering this area adapted and projects aimed at developing of eHealth are usually managed by other Ministries instead of the Ministry of Health [Pokorná, 2011, p. 28].

Moreover, several bodies (mainly under the Ministry) were established to coordinate/ discuss the topic of eHealth:

"The Interdepartmental Coordinating Committee for eHealth implementation in the Czech Republic" was established in 2007. The Committee is composed of experts from all related fields and meets every quarter. Its purpose is to discuss very detail agenda related to eHealth in the Czech Republic [Bartová, 2010, p. 10-12], map projects, set priorities, coordinate activities, map legislation and propose legislation changes [Javorník, 2009]. In 2008, it prepared the so called *"Goals of eHealth projects in the Czech Republic"* encompassing following projects: electronic health records, ePrescription, electronic insurance identification, electronic payment, medical registries of the *„National Health Information System (NHIS)"* and the consolidation of departmental data, computerization of pre / post graduate education, telemedicine, registers of medical and healthcare, data communications interface, health information systems and the central reference health records, classification systems, clinical decision support systems, standards, clinical protocols, computerization of transmission of documents by international payments, health information system for citizens (portals) [Kolín, 2015].

The *"National Forum for eHealth"* was founded in 2007 to discuss up − date − topics related to all national eHealth activities which should be conducted. In 2009, it gained the status of the ProRec centre[10] [Bartová, 2010, p. 10-12]. The results of the activities by The *"National Forum for eHealth"* are creation of some documents (*"Thesis of development of eHealth in the Czech Republic"*(2007) *„The National Plan for Development of eHealth in the Czech Republic"*(2011) and organisation of seminars and conferences [Čabrnoch, n.d.].

The *"Roundtable"* was established by the Minister of Health in 2007. Together with the eHealth Forum, the *"Roundtable"* was one of the first activities that promoted the problematic of eHealth as a high level topic. Its activity was finished in 2010 with publication of several reports [Bartová, 2010, p. 10-12].

The *„Coordination Centre for Departmental Medical Information Systems"* under the Ministry of Health   coordinates development in the field of medical information

---

[10] The EUROREC Institute (EuroRec) is an independent not-for-profit organisation, promoting in Europe the use of high quality Electronic Health Record systems (EHRs). One of its main missions is to support, as the European certification body, EHRs quality labelling and defining functional and other criteria.

systems, national health registers and organizes activities of the Ministry in the field of informatics [Javorník, 2009].

- **Involving stakeholders**

The "*National Plan for Development of eHealth*" in the Czech Republic sets four basic groups of involved stakeholders:

- *Target groups:* patients, health professionals (doctors, pharmacists, nurses and other healthcare professionals), health insurance, state, politicians, medical facilities, science, research, statistic centres [Národní plán rozvoje eHealth, 2010];

- *Industry:* pharmaceutical, technology and medical equipment providers [Národní plán rozvoje eHealth, 2010];

- *Partners: "Association of Regions", "Czech company of medical and scientific informatics", "Czech Chamber of Pharmacists", "eState", "Coalition for Health", "Platform of health insured in the Czech Republic", "Health Care Reform Forum", "Association of Health Insurance Companies", "General Health Insurance Company"* [Národní plán rozvoje eHealth, 2010];

- *Others: "Academy of Sciences",* commercial entities in ICT, *"International Standardization Organization",* patient organizations, operators of healthcare facilities, universities, foreign entities engaged in eHealth, representatives of public administration, health professional organizations [Národní plán rozvoje eHealth, 2010].

- **Legal and regulatory facilitators**

Legislation in the Czech Republic lacks laws concentrated on the problematic of eHealth and includes this topic in more general laws, such as:

- *"Act No. 372/2011 Coll., on Health Services"*
- *"Act No. 101/2000 Coll., on Personal Data Protection"*
- *"Act No. 378/2007 Coll., on Drugs"*

- *"Act No. 227/ 2000 Coll., on Electronic Signature"*
- *"Act No. 499/2004 Coll., on Archives and Records Service"*
- *"Act No. 300/2008 Coll., on Electronic Transactions and Authorized Document Conversion"*
- *"Act No. 111/2009 Coll., on Basic Registers"*
- *"Bylaw No. 98/2012 Coll., on Medical Documentation"* [Kopal, 2014]

Other documents supporting eHealth in the Czech Republic:

1. Strategy called *"Digitální Česko 2.0"* (2012)

2. *"Concept of eGovernment 2013"*

3. *"Strategic framework for the development of public administration and eGovernment 2014+"*

4. *"Zdraví 2020 – National Strategy on health promotion and disease prevention"*

- **Financing and reimbursement issues**

The Czech Republic doesn´t have any specific budgets for electronic healthcare. At the national level, eHealth solutions are usually financed by health insurances (mainly the *"General Health Insurance Company"*) and the Czech Government [Bartová, 2010, p. 12].

eHealth projects in hospitals are financed mostly using general ICT and health budgets. The initial costs of eHealth solutions are high and not able to bring an immediate effect [MVCR, 2010]. This situation is forcing healthcare sponsors to invest in tools bringing immediate effect instead of eHealth solutions. [Národní plan rozvoje eHealth, 2010]. Because of this fact, there are many companies offering smaller eHealth solutions, e.g. *"CompuGroup Medical Česká Republika"*, s.r.o [Systemonline, 2015], *"MediInspect, s.r.o"* [Potůček, 2013].

- **Evaluation activities**

So far, there have been no formal evaluations of eHealth applications conducted in the Czech Republic. Only IZIP has been explored as a pilot case by the projects funded by

the European Commission and *"Kolín - Caslav health data and exchange network"* was studied in one of the reports by the *"EHR Impact study"* examining the change of procedural issues and impacts of socio – economic character [Bartová, 2010, p. 30].

3.3. Deployment of eHealth applications

- **Patient summaries and electronic health records**

IZIP is the abbreviation which stands for the Czech system of electronic health books, full operation of which was launched in 2004 under the auspices of the *"General Health Insurance Company"*. In spite of the fact that during the operation of the system it was being used by about 2.5 million patients, it was ended by the Ministry in 2012. The reason was the insufficient use by physicians and patients [Potančok, 2015].

Regarding medical data contained in IZIP, it included *"the complete history of a patient's medication records and lab tests results since the past seven years"*[eHealth Stakeholder Group, 2013, p. 6]. Since 2011, when one of the biggest laboratories in the Czech Republic was connected to the system, more than 370, 000 lab tests results were sent to the system [eHealth Stakeholder Group, 2013, p. 6].

Two regions with the highest number of on IZIP stored health records were Vysočina and Karlovy Vary [eHealth Stakeholder Group, 2013, p. 6].

The costs of the IZIP project exceeded CZK 1.8 billion. At the moment, a new project that would replace the failed IZIP is being prepared [Potančok, 2015].

- **ePrescription**

The last Czech project in eHealth was the introduction of electronic prescriptions. Its mandatory use should be introduced in 2015 by the amendment to the law that was approved in early 2013. However, according to the Ministry of Health, *"The State Institute for Drug Control (SIDC)"* was not prepared due to necessity of costly extension of its central repository of receipts (almost CZK 70 million and CZK 3.5 million other requested operations). Introducing of obligation to prescribe medical

prescriptions electronically only, has therefore been tentatively postponed to 2018 [Potančok, 2015].

- **Telehealth**

Telehealth has been used for several years in the Czech Republic particularly in the field of heart diseases. It has been financed mainly from resources of the EU. However, last year an important change happened - the *"General Health Insurance Company"* got listed among medical activities which can be refunded from public health insurance also, to telehealth activities. It is technique for remote monitoring of patients with pacemakers and cardioverter -defibrillator. Except for heart diseases, the so called home – monitoring is becoming popular in the Czech Republic [eZDRAV, 2016].

3.4. Infrastructure implementation aspects

- **Electronic identifiers, patient and professionals identification/ eCards**

The main attribute of patient identification in the Czech Republic is still the birth certificate number. The main attribute for identification of a health professional is the health professional´s ID number. Regarding eCards, there has been an idea of eCard with microchip serving the purpose driving licence, insurance status verification and a tool for electronic signature. However, it still is not on the political agenda. eHealth Strategy suggested the use of the electronic European Health Insurance Card by health professionals and patients, but unfortunately, the security details haven´t been specified yet. There are still many issues which are unresolved in the matter of eCards in the Czech Republic – legal, institutional etc [Bartová, 2010, p. 25].

- **Standards (technical/semantic)**

The Ministry of Health prefers training and advising than legal dictating of using of eHealth standards. It organises seminars to raise awareness among providers. Moreover, it carried a study financed from the EU Structural Funds to explore use of standards and make recommendations. Curently, there are mainly *"ICD 10"* and the data standards of the Ministry (*"DASTA"*) used [Bartová, 2010, p. 26].

4. Proposal of the Conception for the Czech Republic

To create a good and realistic conception of eHealth for the Czech Republic, there are several issues, for which there is a need to concentrate on.

Here the suggestions for the eHealth conception of the Czech Republic will be provided, following the structure of the analysis conducted in previous parts of the diploma thesis. These suggestions will be based on the conducted analysis of eHealth in the German speaking countries and in the Czech Republic, too.

4.1. Governance - institutional structures, stakeholder involvement, legal, reimbursement and evaluation issues

- **Administrative responsibility and competence centres**

Basing on the conducted analysis of eHealth in Austria, Germany and Switzerland and regarding the fact that neither of the institutions established in the Czech Republic to promote/ coordinate eHealth haven´t brought any significant success, it can be concluded that creation of a centralized institution responsible for coordination of eHealth in the country is necessary. This institution should be under supervision of the Ministry of Health.

However, the main responsibility for the eHealth project must be held by the Ministry of Health as well as it is in the majority of the European countries. There are several reasons why: spreading of the responsibility among several ministries/ institutions would increase chaos instead of improving coordination of eHealth or for instance the Ministry of Health is responsible for healthcare and its financing.

This should also match the organizational structure of the project team where the Ministry should have at least one representative in the lead of the project team and in the supervisory bodies. Sustainability and governance of eHealth should be in the hands of the Ministry of Health, too.

- **Involving stakeholders**

The previous analysis shows that cooperation among different stakeholders and their motivation definitely belong among the most important factors influencing the implementation of eHealth.

There are various reasons for this phenomenon: unwillingness of some actors is able to block development in implementation of a solution, some groups can influence another group of stakeholders etc.

For example, how it is possible to read in the conducted analysis, in Austria, the implementation of ELGA is negatively influenced by the fact that physicians don´t agree with its implementation. Similarly, the functionality of the eCard as the citizen card in Austria, and the eCard in general in Switzerland are facing the problem of low trust from patients. Regarding the influence among various groups of stakeholders in eHealth, in Switzerland, it is possible to observe that the more medical professionals are willing to use eCard, the more patients trust in these cards.

These facts suggest that it is very important to ensure cooperation among eHealth stakeholders in the Czech Republic, what should lead to creation of the unified eHealth conception. Furthermore, exact roles of the stakeholders in eHealth should be defined, and it should be ensured that only the solutions that all the relevant stakeholders agreed on will be implemented. It would be also beneficial to discuss with the future supposed users of an application if they really want it. This would help to avoid the situation wherein an expensive application is not used because no one wants it. The motivation of stakeholders should be increased, what could be accomplished by different marketing and PR activities.

Following groups of stakeholders and their needs should be defined:

Patients

Patients should be motivated by better healthcare and more awareness which eHealth can offer them [ezdrav, 2016]. Firstly, they need more information about their own health, health of their relatives and risks to their health. These information can support their decision making processes on the topic of their health. Further, they need the possibility to consult their health with professionals and to get an access to medical advice.

Moreover, there is a need to simplify life of patients. For example, their stay in the hospital can be shorten by using some home - monitoring applications or for instance they can get some medical services without the need of their physical presence in a healthcare facility. A lot of processes in healthcare could be fastened, which would be very beneficial for patients, too [eHealth Forum, 2010].

Healthcare providers/ medical professionals

eHealth should bring various benefits for healthcare professionals: time – saving, greater convenience, less administrative work. They need to get a quick and safe access to information about the patient: identification, insurance status, pre – paid medical procedures, health related information and a possibility to archive information about the patient. They need an opportunity to exchange documents and communicate with other healthcare stakeholders. Furthermore, they need a quick access to scientifically relevant findings related to currently implemented health performance. They also need to limit/ fasten the administrative work. Further, there is the need of the semantic interoperability (terminological) between health professionals in the Czech Republic and the EU [eHealth Forum, 2010].

Insurance companies

The priorities of insurance companies are an increased transparency of medical services provided by healthcare providers, the possibility of information sharing with other stakeholders of the healthcare system, and clear identification of insured persons [eHealth Forum, 2010].

State, Ministry of Health, regional offices

The State needs an access to information in order to evaluate social changes, monitor the effectiveness of the use of funding from public sources, deal with crisis management and accomplish interoperation of eHealth and eGovernment.

The Ministry of Health needs an access to information to create all the documents related to its activities.

Regional offices have similar needs like the State but at the regional level [eHealth Forum, 2010].

Pharmaceutical, technology and medical equipment providers

Providers should have an access to current information about healthcare standards, legislation, limits by the insurance company and conditions for accreditation and certification [eHealth Forum, 2010].

Academic, scientific and research institutions

These institutions need mainly an access to information and possibility of information – sharing at the both, national and international level, to foster education and research related to health [eHealth Forum, 2010].

State Institute for Drug Control

The *„State Institute for Drug Control"* needs mainly an access to information in order to create documents related to its activities and monitoring systems in order to control issuing, testing, selling and manufacturing of drugs [eHealth Forum, 2010].

Public Health

The basic need of the public health is to have an access to healthcare related information [eHealth Forum, 2010].

- **Legal and regulatory facilitators**

eHealth legislation

The above mentioned laws show that the Czech Republic has only partially developed legislative environment for the full use of eHealth.

Many questions still remain legislatively untreated what limits the further development of eHealth. Among such questions belongs mainly the legislation defining the work with medical documentation in the electronic form, in spite of the fact that some questions regarding this topic are included in the *"Bylaw No. 98/2012 Coll., on Medical Documentation"* [Kopal, 2014].

Therefore, it would be beneficial to introduce a law treating electronic health records, similarly like in Austria and Switzerland.

This legislation should provide an express definition of EHR, define the content of an EHR, define possible forms of the documentation, specify rules on the *"use of a common terminology or coding system to identify diseases, disorders, symptoms"* [Kopal, 2014], define categories of health data according to their confidentiality, define *"opt – out"* possibilities for citizens and specify measures related to data security [Kopal, 2014].

eHealth strategy

The official eHealth strategy of the Czech Republic should be created. The Strategy should define the most important fields of interest, set goals to achieve and a plan for their achieving. It can be inspired for example by the Swiss Strategy which is devoted to three main topics: implementation of the Strategy, electronic Patientendossier and online – services and for each of these areas sets detail objectives.

Specifically, (and regarding the topics analysed in this thesis) the areas of interests for the Czech Republic should be: implementation of the Strategy, IZIP, and ePrescriptions. For each of these areas, specific aims and deadlines should be set.

- **Financing and reimbursement issues**

Regarding the fact that eHealth is currently financed from the overall healthcare budget, it would be beneficial to create a budget of its own for financing of eHealth activities.

In the case of financing, the Czech Republic could be inspired by Austria. In Austria, they have a separate budget for eHealth to finance planning activities and pilots. Furthermore, the Federal Government and the federal states in Austria made an agreement that financing of the system has to be guaranteed in order to successfully implement the ELGA system. In the Czech Republic, financing of a specific project could be guaranteed, too, to avoid cases that a project has to be cancelled because of insufficient funding.

The first started projects in Austria were those with the supposed cost − reducing effects. In the Czech Republic, there could be an initial focus on such activities, too.

Furthermore, the Czech Republic should concentrate on continuation of the already started projects because a lot of money has already been spent on them. Further, it is essential to be maximally realistic about plans and the state to achieve as the situation of eHealth in the Czech Republic is not very ideal yet as the amount of money that can be spent on eHealth is limited.

- **Evaluation activities**

Exactly like the *"eHealth Suisse"* in Switzerland, it can be beneficial to create a body responsible for eHealth evaluation activities in the Czech Republic, too.
Regarding specific activities, there are several things that should/ could be realised. Similarly, like the feasibility study for ELGA in Austria and the eCard cost − benefit analysis in Switzerland, feasibility studies and cost − benefit analysis should be conducted before starting an important project. Moreover, similar to the *"Regulation on tests measures for the implementation for the electronic health card"* in Germany, regulations defining measures for testing of eHealth applications can be made.

4.2. Deployment of eHealth applications

Regarding the eHealth applications in the Czech Republic in general, it is possible to say that it would be better to continue in the already started projects than to begin some

new projects, as there already are some experience gained and lessons learnt and some things that already have been done. By these projects mainly IZIP and ePrescriptions are meant when we take into account only the projects analyzed in this diploma thesis. Starting of new projects would mean wasting of time and money which have already been spent on the previous solutions.

Further, it is essential to be maximally realistic about the state that we want to achieve as the situation of eHealth in the Czech Republic is not very ideal yet as the amount of money that can be spent on eHealth is limited. Therefore, a clear eHealth strategy has to be introduced, and feasibility studies and cost – benefit analysises have to be conducted before planning and starting a project.

Moreover, similarly like in Germany, the solution suggested in the conception should allow future integration of additional modules / services following the evolving needs for effective management and provision of healthcare for citizens.

It would be also beneficial to divide the implementation of eHealth into sub-units. The gradual building of eHealth from sub-defined components and projects should significantly reduce risks and increase success in achieving the objectives of the computerization of healthcare.

Furthermore, there should be a great focus on information privacy and data security and sensitive data should be kept under control. This problem should be solved by the introduction of the legislation which is described in the section *"Legal and regulatory facilitators"*.

Last but not least, the widest possible use of existing information and primary storage at the place of production at the level of care would be essential.

- **Patient summaries and electronic health records**

Regarding eHealth applications, introduction of a functional electronic health records system should be the main aspect to concentrate on. Due to several reasons, it would be beneficial to continue in the already functional and cancelled project of the *"Czech system of electronic health books"*, shortly IZIP.

Firstly, an enormous amount of money and effort has already been spent on building this system and both, cancelling this project forever and beginning a new project would mean unnecessary wasting of money and time.

Secondly, technical functionality and administration of the system has already been proved, some best practices have been gained, and some of the users have already been used to it.

Thirdly, the project gained various important prizes both, in the Czech Republic and in the European Union, which prove that IZIP is a good project which can have a positive impact both, on life of citizens and development of information society. Moreover, the prizes like the *"eEurope Awards for eHealth"*by the European Commission suggest that this project belongs among the better eHealth projects in the European Union [Open Clinical, 2006].

According to the conducted analysis, the operation of the system was ended mainly because of insufficient use by patients and medical professionals and too large cost ratio of the project.

To solve these problems, the users of IZIP should be supported and motivated to use the system. This could be reached by improving of PR of the project, organisation of seminars aimed at benefits of IZIP and user trainings. Following the example of Austria, ombudsman centres could be established to consult and help to citizens in regard of IZIP matters.

To reduce costs, some analysis which could identify the possible ways of cost reduction should be conducted. Then, the recommendations by this analysis should be implemented. Some processes could be optimised. An analysis should be made to identify benefits which can be brought by the functional operation of the system. Similarly like *"gematik"* in Germany, more stakeholders could be invited to take part in financing of introduction of the system. Moreover, a contract among these stakeholders which would ensure financing of the system should be created like it is in Germany and Austria.

 If the Czech Republic would like to use an example of the EHR implementation in some of the German speaking countries, Austria would be the best option as it reached the biggest progress in this matter.

- **ePrescription**

As the Czech Republic is the only one from the analysed countries that have already planned and introduced ePrescriptions, it could serve as an example for the German speaking countries and not the other way.

For the Czech Republic it would be essential to solve the problems with the extension of the repository of recipes by the *"State Institute for Drug Control (SIDC)"* and to finish the already introduced solution. The reason is the same like by IZIP. It has already been started, and a lot of energy, time, effort and money have already been spent on it.

Besides of the problem with the repository of the SIDC, ePrescriptions face to the unwillingness of medical Professional to use them. The low use of ePrescription by doctors and hospitals is often caused by the necessity of using the electronic signature that generates the high costs of operating the electronic prescription system. Replacing of electronic signature by internal certification should simplify using ePrescription, both for doctors and pharmacies.

- **Telehealth**

Last year, an important change happened - the *"General Health Insurance Company"* listed among medical activities which can be refunded from public health insurance also two telehealth activities. It is a remote monitoring of patients with pacemakers and cardioverter – defibrillator [eZDRAV, 2016]. This step can be regarded as very positive and it could be beneficial to continue this way.

4.3. Infrastructure implementation aspects

- **Electronic identifiers and eCards**

It is important that every person with the access to information (with the exception of the public health portal) has to be uniquely identified and his identification has to be proved. Personalization which means that available applications, access rights, the scope of information, the manner of their display and presentation depend on the user, and that user must be specific, identified and authenticated person is also important.

In the Czech Republic, the so called number of the insurant is normally used to identify an insured person. This number is usually same as the personal identification number of a citizen. The numbers of the insurants are managed by the individual registers of health insurance, but they are also registered in the central register of insurants, maintained by the *„General Health Insurance Company"* of the Czech Republic. Numbers for foreign citizens insured in the Czech Republic are granted to them [Stapro, 2013].

In the EU, the most widespread identifier of health insurance is the ID number of the European Health Insurance Card (EHIC) which has been assigned also to all insurants in the Czech health insurance companies. There is therefore a clear link between the number of the insurant and the number of EHIC in Czech health insurance companies.

In medical facilities, there is in order to identify administrative and medical records of the patient usually used the identification number of a citizen. This number is also an identifier in cases of data exchange among medical facilities [Stapro, 2013].

Due to protection of sensitive data about health of patients, the personal identification number of a citizen (which is a semantic identifier) should be replaced with another type of identifier which doesn´t bear any meaning. The EHIC could be used as such identifier [Stapro, 2013].

Introduction of eCard could significantly fasten the identification process as doctors and pharmacists wouldn´t need to type the identification number in the system.

In the Czech Republic, there has been introduced an idea of eCard with microchip serving also like driving licence, insurance status verification and tool of electronic signature [Bartová, 2010].

As the analysis of the German speaking countries shows, there is no need to introduce eCard supposing that it will be used also with other purposes than the insurance and patient card.

For example, it is proved that the use of eCard in Austria with the functionality of eGovernment card stayed without success and there isn´t any reason to suppose that in the Czech Republic it would be different. That is why, it is very optimistic to expect that it could be used like the driving licence or the tool of electronic signature.

One of the biggest benefits of eCard would be enabling of identification based on the photograph on the card which can help to simplify the identification.

- **standards (technical/semantic)**

Firstly, it is important to set standards necessary for the development and long-term sustainability of eHealth and monitor their implementation. In order to set such standards, a responsible body should be established.

Further, it is necessary to regularly innovate standards in cooperation with professionals with the purpose of quick reaction on changes and development in praxis. Technical and semantic standards have to be in accordance with the European and international standards. The most important step is to ensure a secure access to patient and transactional data. Methodology for ensuring security and guidance in the use of standards and eHealth components have to be introduced [Národní plan rozvoje eHealth, 2010].

The main standard recommended to use is:

HL7 as it is a world – implemented protocol used by the IHE recommendations and by the world information systems. This standard is similar to the Czech data standard „DASTA". In the Czech Republic, there are efforts being made about the convergence of these two standards. These efforts should continue [Stapro, 2013].

Conclusion

The main aim of this master thesis was to analyse national eHealth strategies of the German speaking countries and create a draft concept for the eHealth strategy for the Czech Republic based on this analysis.

The partial aims of this master thesis were:

- Analysis of the national eHealth strategies of the German speaking countries and their comparison
- Contribution to the creation of the national eHealth strategy in the Czech Republic, providing relevant information obtained from the strategies of the German speaking countries
- Critical evaluation of the current state of the eHealth strategy of the Czech Republic and creation of a draft concept for the eHealth strategy for the Czech Republic

To achieve the set aims, the following steps were made:

At the beginning of the diploma thesis, the analysis of eHealth and its technologies in Austria, Germany and Switzerland was provided. Afterwards, the states in the countries were compared. At the end, the state of eHealth in the Czech Republic was analysed   and the proposal of the conception for the Czech Republic was provided.

Outcomes and expected contributions

The main contribution brought by this thesis is a draft concept for the eHealth strategy for the Czech Republic. Moreover, the analysis of the current state of eHealth in the selected states following the structure from - *"The Final European progress report"* - can represent an update of the analysises which were conducted in the countries in 2010 to create this report. Creation of such updates can be interesting mainly because of the fact that there are many changes that have occurred in these states since 2010.

Results

Basing on the conducted analysises, several recommendations for the Czech Republic were made:

First of all, there have already been several investments made, and e − governmental projects (IZIP, ePreskripce, eNeschopenka) implemented and planned. It would be very beneficial to preserve these investments as they have already provided some lessons learnt, users have already got used to some of these applications/have awareness about them, a lot of money has already been spent on them. In the other words, it would be beneficial to continue with these projects, that have already been started and for some reason haven´t been completed, or at least there has already been some work done on them. Moreover, it is necessary to conduct only those projects which all the involved stakeholders agreed upon, to ensure that the progress of the projects won´t be blocked by unwillingness of certain stakeholder groups.

Secondly, it is essential to be completely realistic about the state to achieve as the situation of eHealth in the Czech Republic is not very ideal yet - the amount of money that can be spent on eHealth is limited, potential users often show a lack of excitement about eHealth etc.

Thirdly, there should be a maximum use of certified standards.

Fourthly, it is necessary to take into account all possible legislative restrictions, the eHealth legislation should be extended and the official eHealth strategy of the Czech Republic should be created as soon as possible.

Fifthly, the automation of healthcare should be systematically supported, and users of eHealth should be motivated to want and use eHealth applications. Moreover, it is necessary to educate future users of eHealth, both the medical professionals and patients.

Last but not least, there should be a great focus on information privacy and data security and sensitive data should be kept under control and stored safely under all circumstances.

Glossary

Term	Abbreviation	Definition/ Resource
eHealth		*"the use of information and communication technologies for health"* [WHO, 2015]
eCards		eCards are electronic versions of insurance cards which realisation varies in the EU countries in various aspects: the type of card, the data stored on the card, the sophistication of the security features, the use [Stroetmann, 2011].
Electronic health records	EHR	Patient´s electronic health record (EHR) is defined as *"a longitudinal electronic record of a patient health information generated by one or more encounters in any care delivery setting"*[Menachemi, 2011].
ePrescriptions		The term e-prescription stands for both, the direct computer-to-computer transmission of the prescriptions from a doctor to a pharmacy [Odukoya, 2003] and bringing of the prescription from the doctor to the pharmacy by the patient stored on a secure data medium. The main advantages of this tool are significant fastening of the process, reliable issuing of medicine to patients and cost saving [Lehmann, 2005].
Telemedicine		Telemedicine is defined as *"the delivery of healthcare services through the use of Information and Communication Technologies (ICT) in a situation where the actors are not at the same location"* [Schmid, 2010].

Figures and tables

Figures

Fig 1: Vision of connected healthcare [IMS Institute for Healthcare Informatics, 2015]

Fig 2 : eCard Austria [ecard, n.d.]

Fig 3 : oCard Austria [ecard, n.d.]

Fig 4: eCard in Germany [Liberman, 2012]

Fig 5: Health professional card in Germany [Federal Ministry of Health, 2015]

Fig 6: eCard in Switzerland [ehealthsuisse, 2015]

Tables

Tab 1: Coordination bodies for eHealth [author, 2016]

Tab 2: eHealth laws and strategies[author, 2016]

Tab 3: EHR [author, 2016]

Tab 4: eCards – administrative questions [author, 2016]

Tab 5: eCards – functionality questions [author, 2016]

Tab 6: eCards – technical questions [author, 2016]

Tab 7: Standards [author, 2016]

Bibliography

AHERN, D. K., KRESLAKE, J. M., PHALEN, J.M., BOCK, B. What Is eHealth (6): Perspectives on the Evolution of eHealth Research. *Journal of Medical Internet Research* [online]. 2006, 8(1), - [cit. 2016-01-11]. DOI: 10.2196/jmir.8.1.e4. ISSN 1438-8871. Available from: http://www.jmir.org/2006/1/e4/

Austria Federal Chancellery. National Reform Programme. [Online] 2013. [Cit: 8. 3 2016.] http://ec.europa.eu/europe2020/pdf/nd/nrp2013_austria_en.pdf.

BARTOVA, S., DUMORTIER, J., ARTMANN, J., WALOSSEK, U., GIEST S. eHealth Strategies, Country brief: Czech Republic. *Academia.* [Online] 2010. [Cit: 23. 4 2016.] https://www.academia.edu/1400746/Country_Brief_Czech_Republic.

BILLER-ANDORNO, N., ZELTNER, T. Individual Responsibility and Community Solidarity — The Swiss Health Care System. *The New England Journal of Medicine*[Online] 2015, 373:2193-2197. http://www.nejm.org/doi/full/10.1056/NEJMp1508256.

BOZIKOV, J. Great potentials for health and wellbeing, but also for harmonization and European integration in health. *South Eastern European Journal of Public Health.* [Online] 2015. [Cit: 16. 3 2016.] http://www.seejph.com/index.php/seejph/article/download/7/pdf.

BUGNAR, M. e-health in Austria – An overview. [Online] 2010. [Dátum: 5. 4 2016.] http://www.itapa.sk/data/att/667.pdf.

Bundesministerium der Justiz und fuer Verbraucherschutz. *Verordnung über Testmaßnahmen für die Einführung der elektronischen Gesundheitskarte.* [Online] 2005. [Cit: 23. 4 2016.] https://www.gesetze-im-internet.de/testv/BJNR312800005.html.

Bundesministers für Gesundheit. Verordnung des Bundesministers für Gesundheit zur Implementierung von ELGA. [Online] 2012. [Cit: 15. 3 2016.] https://www.ris.bka.gv.at/Dokumente/Begut/BEGUT_COO_2026_100_2_932029/BEGUT_COO_2026_100_2_932029.pdf.

CATWELL, L., SHEIKH, A. Evaluating eHealth Interventions: The Need for Continuous Systemic Evaluation. *Plos medicine.* [Online] 2009, 6(8). [Citace: 23. 3 2016.] http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1000126.

České národní fórum pro eHealth, ICT Unie. NÁRODNÍ PLÁN ROZVOJE eHEALTH. [Online] 2010. [Dátum: 20. 4 2016.] http://www.mzcr.cz/Soubor.ashx?souborID=15027&typ=application/pdf&nazev=N%C3%A1rodn%C3%AD%20pl%C3%A1n%20rozvoje%20eHealth%20V16.pdf

CIGÁNEK, P., PIRNÍK, R., BRONČEKOVÁ, T. *Nové Trendy ICT v elektronickom zdravotníctve* [online]. Žilina, 2007 [cit. 2016-01-11]. Available from: https://dspace.vsb.cz/bitstream/handle/10084/83874/AEEE-2007-6-2-90-ciganek.pdf?sequence=1. Žilinská univerzita v Žiline.

Commission of the European Communities.COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS On the progress made under the Seventh European Framework Programme for research . [Online] 2009. [Dátum: 22. 4 2016.] http://www.societechimiquedefrance.fr/IMG/pdf/FP7-IntermediateReport.pdf.

COMPUGROUP MEDICAL ČESKÁ REPUBLIKA S.R.O. *System OnLine.* [Online] 2015. [Dátum: 25. 3 2016.] http://www.systemonline.cz/dodavatele-it-sluzeb-a-reseni/reseni-pro-verejny-a-statni-sektor-a-zdravotnictvi/compugroup-medical-ceska-republika-s-r-o-.htm.

Country profile: Czech Republic. *Epsos*[Online]n.d. [Cit: 5.3. 2016.] http://www.epsos.eu/home/project-members-beneficiaries/participating-nations/czech-republic.html.

Das E-Health-Gesetz. Bundessministerium für Gesundheit [Online] 2015. [Cit: 5.3. 2016.] https://www.bundesgesundheitsministerium.de/themen/krankenversicherung/e-health-gesetz/e-health.html.

Daten auf der e - card. *ecard.* [Online] n.d. [Cit: 4. 4 2016.] http://www.chipkarte.at/portal27/portal/ecardportal/content/contentWindow?contentid=10007.678597&action=2&viewmode=content.

DORDA, W. Introducing the Electronic Health Record in Austria. [Online] 2005. [Dátum: 23. 4 2016.] http://www.meduniwien.ac.at/msi/mias/papers/Dorda2005a.pdf.

DUGAS, M, SCHMIDT, K . *Medizinische Informatik und Bioinformatik : ein Kompendium für Studium und Praxis.* Berllin : Springer-Lehrbuch , 2003. ISBN 3794520319

ehealthsuisse. [Online] 2016. [Cit: 23. 4 2016.] http://www.e-health-suisse.ch/index.html?lang=de.

E-Health: Gesundheit im Internetzeitalter. *Medizintechnologie.de.* [Online] n.d. [Cit: 23. 4 2016.] https://www.medizintechnologie.de/infopool/medizin-technologie/2013/e-health/.

e-Health-Initiative. Eine Informations- und Kommunikationsstrategie für ein modernes österreichisches Gesundheitswesen. [Online] 2007. [Cit: 10. 4 2016.] https://www.i-med.ac.at/msig/service/oeehealth_strategie.pdf.

eHealth priorities and strategies in European countries. *eHealthNews.* [Online] 2007. [Cit: 24. 4 2016.] http://www.ehealthnews.eu/download/publications/508-ehealth-priorities-and-strategies-in-european-countries.

eHealth Stakeholder Group. Patient access to Electronic Health Records. [Online] 2013. [Cit: 20. 4 2016.] http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=5169.

eHealth Suisse. Strategie eHealth Schweiz. [Online] 2007. [Dátum: 4. 4 2016.] http://www.e-health-suisse.ch/grundlagen/00086/index.html?lang=de.

eHealth v ČR. *eZdrav.cz.* [Online] 2016. [Cit: 24. 4 2016.] http://www.ezdrav.cz/ehealth-v-cr/.

electronic health record (EHR). *whatIs.com.* [Online] 2011. [Cit: 5.3. 2016.] http://whatis.techtarget.com/definition/electronic-health-record-EHR.

European Commission. COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS eHealth Action Plan 2012-2020 - Innovative healthcare for the 21st century. [Online] 2012. [Cit: 20. 4 2016.] http://ec.europa.eu/health/ehealth/docs/com_2012_736_en.pdf.

European Commission. eHealth priorities and strategies in European countries. [Online] 2007. [Cit: 12. 4 2016.] http://www.eski.hu/new3/konyvtar/bookshop/eHealth%20priorities.pdf.

European Commission. Europe 2020 A European strategy for smart, sustainable and inclusive growth. [Online] 2010. http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf.

European Commission. Horizon 2020 - first calls. *European Commission Presse Release Database.* [Online] 2013. https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020.

Federal Office of Public Health (FOP). eHealth strategy for Switzerland . [Online] 2006. [Cit: 20. 4 2016.] http://www.e-health-suisse.ch/index.html?lang=en&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1ad1IZn4 Z2qZpnO2Yuq2Z6gpJCDdHt8gmym162epYbg2c_JjKbNoKSn6A--..

Germany and the challenges of rolling out e-health on a large scale. *esante.gouv.fr.* [Online] 2013. [Cit 23. 4 2016.] http://esante.gouv.fr/en/the-mag-issue-7/germany-and-the-challenges-rolling-out-e-health-a-large-scale.

Give your prescription a head start. *Learn about ePrescriptions.* [Online] n.d. [Cit: 8. 3 2016.] http://www.learnabouteprescriptions.com/what-is-eprescription.aspx.

IMS Institute for Healthcare Informatics. Elements of a Connected Healthcare System. [Online] 2015. [Dátum: 25. 3 2016.] https://www.imshealth.com/files/web/IMSH%20Institute/Reports/Closing%20the%20H ealthcare%20Gap/Elements_of_a_Connected_Healthcare_System.pdf.

Information on the Austrian healthcare system. *gesundheit.gv.at.* [Online] 2014. [Cit: 8. 3 2016.] https://www.gesundheit.gv.at/Portal.Node/ghp/public/content/info-austrian-healthcare-system.html.

Ingenico. e - Health in Europe. [Online] 2012. [Cit: 4. 4 2019.] http://www.healthcare-eid.ingenico.com/iso_album/ing_broch_wp_sante_en_2012_3.pdf.

IZIP. *Open Clinical.* [Online] 2006. [Cit: 26. 4 2016.] http://www.openclinical.org/publicDm_IZIP.html.

Katalog potřeb a služeb eHealth. *eHealth Forum.* [Online] 2010. [Cit: 18. 4 2016.] http://www.ehealthforum.cz/files/katalogsluzeb.pdf.

KOFRÁNEK, J., FELIX, O., POLÁK, J. Jak informatizovat zdravotnictví a nevytvořit přitom velkého bratra. [Online] 2013. [Cit: 23. 4 2016.] http://www.creativeconnections.cz/medsoft/2013/Medsoft_2013_Kofranek.pdf.

KOLÍN, A. Vývoj konceptu eHealth v ČR. *Ikaros* [online]. 2015, 19 (3) [Cit: 26.4.2016]. urn:nbn:cz:ik-17463. ISSN 1212-5075. Available from: http://ikaros.cz/node/17463

KOPAL, J. Overview of the national laws on electronic health records in the EU Member States: National Report for the Czech Republic . [Online] 2014. [Cit: 20. 4 2016.] http://ec.europa.eu/health/ehealth/docs/laws_czech_republic_en.pdf.

KUKUROVÁ, E., LABAŠ, P. *Fragmenty z elektronizácie zdravotníctva v teórii a praxi*. Praha: Evropská asociace pro fototerapii, 2013, 160 s. ISBN 978-80-87861-06-6.

LEHMANN, T. M. *Handbuch der medizinischen Informatik* . München : Wien : Hanser, 2005. 927 p,. ISBN 3-446-22701-6

LIBERMAN, G. e - Health in Europe. *Ingenico*[Online] 2012. [Cit: 4. 4 2019.] http://www.healthcare-eid.ingenico.com/iso_album/ing_broch_wp_sante_en_2012_3.pdf.

LIVERI, D. , SARRI, A., SKOLOUDI, Ch. Security and Resilience in. *enisa.* [Online] 12 2015. [Cit: 24. 4 2016.] https://www.enisa.europa.eu/publications/security-and-resilience-in-ehealth-annex-a-countries2019-report.

Menachemi, N. Benefits and drawbacks of electronic health record systems. *Risk Management Health Policy.* [Online] 2011, 4:47-55. [Dátum: 4. 4 2016.] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3270933/.

MENTZINITZ, P. Die elektronische Gesundheitskarte – Made in Germany. *Telemedizin E-Health Telemedizinführer Deutschland - Deutschlands unfassendstes Werk zum Thema Telemedizin.* [Online] 2016. [Cit: 22. 4 2016.] http://www.telemedizinfuehrer.de/index2.php?option=com_content&do_pdf=1&id=180 http://www.epsos.eu/home/project-members-beneficiaries/participating-nations/czech-republic.html.

OBERMANN, K. Understanding the German Health Care System. [Online] 2013. [Cit: 24. 4 2016.] http://www.goinginternational.eu/newsletter/2013/nl_03/SpecialDE_EN_Understanding_the_German.pdf.

ODUKOYA, O. K., CHUI, M. A. Relationship between E-Prescriptions and Community Pharmacy Workflow. *US National Library of Medicine* . [Online] 2003, 52(6):e168–e174.. [Cit: 5.. 3. 2016.] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3623613/.

OLSSON, S., LYMBERIS, A., WHITEHOUSE, D. EUROPEAN COMMISSION ACTIVITIES. *International Journal of Circumpolar Health.* [Online] 2004, 63:4. [Cit: 23. 4 2016.] http://journals.co-action.net/index.php/ijch/article/viewFile/17747/20219.

PFEIFFER, K. P., DUMORTIER, J., GIEST, S., ARTMANN, J. eHealth Strategies, Country brief: Austria. *Yumpu.* [Online] 2010. [Cit: 23. 4 2016.] https://www.yumpu.com/en/document/view/8044739/country-brief-austria-ehealth-strategies.

POKORNÁ, T. Komparace implementace eHealth v České republice a na Slovensku v kontextu doporučení EU. *MASARYKOVA UNIVERZITA*. [Online] 2011. [Dátum: 20. 4 2016.] https://is.muni.cz/th/220057/fss_m/diplomova_prace.pdf.

POTANČOK, M. IS/ICT ve zdravotnictví v České republice a ve Švédsku. [Online] 2015. [Dátum: 17. 3 2016.] http://www.cssi.cz/cssi/system/files/all/SI_2015_1-2__02_Potancok_Judova_Karasek_Zakutny.pdf.

POTŮČEK, J., KORANDA, P., KORČ, T. Informační řešení pro poskytování asistenční dohledové služby a telemedicíny. *InspectLife*. [Online] 2013. [Cit: 20. 4 2016.] http://www.stech.cz/Portals/0/Konference/2013/02-21%20eHealth/15%20MEDIINSPECT_InspectLife_prezentace_eHealth_Day_2013.pdf.

ROSENMÖLLER, M. *Managing eHealth: from vision to reality* [online]. 1. Hampshire: Palgrave Macmillan, 2014 [cit. 2016-01-11]. ISBN 978-1-137-37942-9. Available from: https://books.google.cz/books?id=KdRCBAAAQBAJ&printsec=frontcover&hl=sk&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

SAHAMA, T., SIMPSON, L. Security and Privacy in eHealth: is it possible? [Online] 2016. http://eprints.qut.edu.au/62247/1/Sahama_et_al_2013_IEEEHealthcom13.pdf.

SCHMID, A., WYSS, S., GIEST, S. eHealth Strategies, Country brief: Switzerland. *Academia*. [Online] 2010. [Dátum: 23. 4 2016.] https://www.academia.edu/869241/Country_Brief_Switzerland.

SCHUERGERL, R. The Austrian e-card System - experiences of a nationwide eHealth infrastructure. *Social Science Research Network*. [Online] 2014. [Cit: 3. 3. 2016.] http://poseidon01.ssrn.com/delivery.php?ID=104119098102027003122078092000098007042068069003049020126091030087121119103007095028042013055035009000054124077098065084075074102052026003014071085076099028083071026088066039027080021000121070093096095065070020120.

SCHWEIGHOFER, E. Overview of the national laws on electronic health records in the EU Member States: National report for Austria. [Online] 2014. [Dátum: 26. 4 2016.] http://ec.europa.eu/health/ehealth/docs/laws_austria_en.pdf.

SEDLÁK, J. Půl miliardy na „nový IZIP". První kolo tendru vyhrál Microsoft. *E15.cz Zprávy*. [Online] 2012. [Dátum: 15. 4 2016.] http://zpravy.e15.cz/byznys/technologie-a-

media/pul-miliardy-na-novy-izip-prvni-kolo-tendru-vyhral-microsoft-936640#utm_medium=selfpromo&utm_source=e15&utm_campaign=copylink.

STAPRO. Soutěž o návrh „Hospodárné a funkční elektronické. [Online] 2013. [Dátum: 15. 3 2016.] http://www.mzcr.cz/dokumenty/soutez-o-navrh-s-nazvem-hospodarne-a-funkcni-elektronicke-zdravotnictvi_7031_2783_1.html.

STROETMANN, K. A., ARTMANN, J., STROETMANN, V. N. European countries on their journey towards national eHealth infrastructures. *esacproject.net.* [Online] 2011.
http://es.esacproject.net/sites/intranet.esacproject.net/files/ehstrategies_final_report.pdf.

STROETMANN, K. A., ARTMANN, J., GIEST, S. eHealth Strategies, Country brief: Germany. *Yumpu.* [Online] 2010. [Cit: 23. 4 2016.] https://www.yumpu.com/en/document/view/5138590/country-brief-germany-ehealth-strategies.

STROEHER, A. *Verfügbare eHealth-Applikationen in Österreich : Evaluierung in Bezug auf funktionelle Benutzeranforderungen .* Saarbrücken : VDM, Verl. Müller , 2010. ISBN 978-3-639-23417-6 . 112 s. 12 – 13

STŘEDA, L., PANÝREK, P. *EHealth a telemedicína.* 1. vyd. Praha: High Tech Park, 2011, 1 CD-ROM. ISBN 978-80-254-9509-4.

Switzerland. *Hospitals in Europe.* [Online] [Cit: 24. 4 2016.] http://www.hope.be/03activities/quality_eu-hospitals/eu_country_profiles/switzerland-eu_hospitals-profile.pdf.

Telemedicína v Česku – co se nabízí a co na to zdravotní pojišťovny? *eZdrav.cz.* [Online] 2015. [Cit: 5.3. 2016.]
http://www.ezdrav.cz/telemedicina-v-cesku-co-se-nabizi-a-co-na-to-zdravotni-pojistovny/.

The Austrian Health Care System. *Bundesministerium fuer Gesundheit.* [Online] 2013. [Cit: 5.. 3. 2016.]
http://www.bmg.gv.at/cms/home/attachments/3/4/4/CH1066/CMS1291414949078/austrian_health_care_key_facts_2013.pdf

The Benefits of eHealth Readiness . *dell.com.* [Online] 2006. [Cit: 23. 4 2016.]
http://www.dell.com/downloads/global/solutions/public/articles/benefits_ehealth_readiness.pdf.

The Electronic Health Card. *Federal Ministry of Health.* [Online] 2015. [Cit: 20. 4 2016.] http://www.bmg.bund.de/en/health/the-electronic-health-card.html.

The Health Insurance System in Germany. *Verbraucher Portal.* [Online]2016. [Cit: 24. 4 2016.] https://www.1averbraucherportal.de/versicherung/krankenversicherung/en#.

The Swiss healthcare system.*Expatica.* [Online] 2012. [Cit: 5.3. 2016.] http://www.expatica.com/ch/healthcare/Getting-healthcare-in-Switzerland_103130.html.

VYHLÁŠKA ze dne 22. března 2012 o zdravotnické dokumentac. *Sbírka zákonů č. 98 / 2012.* [Online] 2012. [Cit: 17. 4 2016.] http://www.kr-ustecky.cz/VismoOnline_ActionScripts/File.ashx?id_org=450018&id_dokumenty=166 6485.

WILKOWSKA, W., ZIEFLE, M. Privacy and data security in E-health: Requirements fromthe user's perspective. *Health Informatics Journal*[Online] 2012, 18(3) 191–201. [Citace: 5.3. 2016.] http://www.comm.rwth-aachen.de/files/10.1177_1460458212442933.pdf.

WHO EURO , MZ ČR. Doporučení pro strategii elektronického zdravotnictví (eHealth) pro Českou republiku. [Online] 2012. [Cit: 4. 4 2016.] http://www.mzcr.cz/Soubor.ashx?souborID=15026&typ=application/pdf&nazev=.

World Health Organisation. eHealth. *WHO.* [Online] 2016. http://www.who.int/topics/ehealth/en/.